HITACHI

MODEL V-1065/V-1060
V- 665/ V-660
OSCILLOSCOPE

SERVICE MANUAL

Hitachi Denshi, Ltd.

AIL

WARRANTY

This Hitachi Denshi, Ltd. product is warranted against defects in workmanship and materials. If any failure, resulting from a defect in either workmanship or material shall occur under normal use within THREE YEARS from the original date of purchase, such failure shall be corrected free of charge to the original purchaser by repair or, at Hitachi Denshi's sole option, replacement of the defective part or parts. No charge shall be made for labor or services performed during said THREE YEARS period providing the defective product is brought or sent prepaid to our Authorized Service Station. Hitachi Denshi, Ltd. will either repair or at its sole option, replace any part except for fuses, probes, lamps, batteries and other optional materials which are defective in either workmanship or material under normal and proper use.

This warranty does not cover equipment which has been tampered with in any way, or to damage caused by accident, negligence, alteration, or misapplication. This product must be returned transportation prepaid, properly packed and insured. Hitachi Denshi, Ltd. bears transportation cost of the repaired product back to the purchaser. This warranty applies only to the original purchaser.

NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED. HITACHI DENSHI, LTD. IS NOT LIABLE FOR CONSEQUENTIAL DAMAGES.

WARNING

The service manual is prepared for qualified service personnel only. Do not perform any servicing if you are not qualified service personnel to avoid possible personnel injury, electrical shock, exposure to X-radiation, fire and other hazard.

Take X-radiation protective measures for personnel during servicing to reduce the risk of possible exposure to X-radiation.

Replace with a CRT and other critical components of the same type number and the same rating for continued safety.

SERVICING PRECAUTIONS

Read all instructions in the service manual and safety markings on the product thoroughly before servicing.

Disconnect power cord from power source before opening the enclosure.

NOTICE

This Service Manual describes the most typical product of this model. If there are any specific differences between this Manual and the servicing unit, please contact Hitachi Denshi sales office in your area.

CONTENTS

1. Specifications 1
2. Accessories 5
3. Preventive maintenance 5
4. Calibration 7
   - 4.1 Calibration interval 7
   - 4.2 Test equipment required 7
   - 4.3 Preliminary procedure 7
   - 4.4 Preliminary control settings 9
   - 4.5 Initial starting procedure 9
5. Detailed circuit description 34
   - 5.1 VERTICAL CIRCUIT (◇1 , ◇2 1/2, ◇3 1/3 , ◇9 1/4) 34
   - 5.2 CALIBRATOR (◇3 2/3) 41
   - 5.3 TRIGGER CIRCUIT (◇2 2/2, ◇3 3/3, ◇9 2/4) 41
   - 5.4 SWEEP CYCLE (◇5) 47
   - 5.5 SWEEP (◇6 1/2) 57
   - 5.6 H AMP (◇7 1/2) 63
   - 5.7 UNBLANKING & Z-AXIX AMP (◇7 2/2, ◇8 1/2, ◇9 3/4, ◇10) 67
   - 5.8 VERTICAL CH SWITCHER (◇6 2/2) 73
   - 5.9 μ-COM, CHR GEN & FRONT PANEL (◇8 2/2, ◇9 4/4) 75
   - 5.10 HV, CRT (◇10) 85
   - 5.11 POWER (◇11) 93
6. Electrical parts arrangement (With adjustment locations) 99
7. Electrical parts lead configurations 111
8. Electrical parts list 115
   - PEF-781 V-PRE & TRIG AMP 115
   - PEF-782 SWP LOGIC 120
   - PEF-783 PANEL 124
   - PEF-784 POWER 124
   - PEF-785 V OUT 127

PEF-786 DLY 1 128
PEF-787 DLY 2 129
PEF-788 DLY 3 129
PEF-789 CRT SOCKET 1 129
PEF-816 FILTER 129
PEF-817 ROM PG 130
PEF-833 ATT R/O 130
PEF-835 CRT SOCKET 2 130
PEF-837 CYCLE 131
CHASSIS 132
9. General block diagram 133
10. Schematic diagrams
◇1 CH1 & CH2 ATT (PEF-781) 135
◇2 CH SWITCH & DLY DRIVER (PEF-781) 137
◇3 V-665, 660 V OUT AMP (PEF-785) 139
◇3 V-1065, 1060 V OUT AMP (PEF-785) 141
◇4 TRIG AMP & TRIG GEN (PEF-781, 782) 143
◇5 CYCLE (PEF-782, 837) 145
◇6 SWEEP GEN (PEF-782) 147
◇7 H AMP & H OUT AND Z-CONTROL (PEF-782, 784) 149
◇8 μ-COM & ROM PG (PEF-782, 817) 151
◇9 CHR GEN & FRONT PANEL (PEF-782, 783) 153
◇10 HV, Z, CRT (PEF-784, 789) 155
◇11 POWER (PEF-816, 784) 157
INTERCONNECTIONS 159
11. Mechanical parts list and exploded view 160

"WARNING - THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO."

1. SPECIFICATIONS

	V-1065	V-1060	V-665	V-660
○ CRT				
Graticule	6-inch screen with internal graticule 0%, 10%, 90% and 100% markers 8 x 10 DIV (1 DIV = 1cm)	←	←	←
Phosphor	P31	←	←	←
Accelerating potential	17 kV approx.	←	12 kV approx.	←
External intensity modulation	Coupling : DC coupling Voltage : 5 V or more Maximum input voltage : 30 V (DC + AC peak) or 30 Vp-p AC at 1 kHz or less Bandwidth : DC to 5 MHz	←	←	←
○ Vertical deflection system				
Sensitivity	2 mV/DIV to 5 V/DIV ±3% (switchable in 11 steps) Continuously variable	←	←	←
Bandwidth	DC to 100 MHz -3dB 2 mV/DIV : DC to 20 MHz -3dB AC low pass : 10 Hz	←	60 MHz 10 MHz ←	←
Rise time	3.5 ns approx. 2 mV/DIV : 17.5 ns approx.	←	5.9 ns approx. 35 ns approx.	←
Delay time	Leading edge can be monitored	←	←	←
Maximum input voltage	400 V (DC + Ac peak) at 1 kHz or less	←	←	←
Input coupling	AC, DC, GND	←	←	←
Input impedance	1 M ohms +1.5%, 23pF ±3pF	←	←	←
Display modes	CH1, CH2, DUAL, CHOP(250 kHz approx.), ADD(DIFF mode can be established when the CH2 is in the INVERT mode.)	←	←	←
Bandwidth limiting function	20 MHz	←	10 MHz	←
Polarity selection	± (CH2 only)	←	←	←
Common-mode rejection ratio	20 dB minimum at 20 MHz	←	10 MHz	←

	V-1065	V-1060	V-665	V-660
X-Y operation	X-axis, Y-axis selectable	←	←	←
Sensitivity	X axis : CH1, CH2 2 mV to 5 V/DIV ±3% EXT 0.1 V/DIV ±5% EXT÷10 1 V/DIV ±5% Y axis : 2 mV to 5 V/DIV ±3%	←	←	←
Phase error	3° or less from DC to 50 kHz	←	←	←
X bandwidth	DC to 500 kHz (-3 dB)	←	←	←
o Horizontal deflection system				
Trigger mode	Trigger, auto trigger	←	←	←
Sweep mode	Main sweep, continuous delay sweep, alternate sweep, single sweep	←	←	←
Trigger source	CH1, CH2, EXT (AC,DC,DC÷10), LINE	←	←	←
TV trigger	Exclusive sync separator circuit provided Sync polarity: -	←	←	←
Trigger Sensitivity				
NORM mode	Frequency / DC to 20 MHz / 20 MHz to 100 MHz INT / 0.35 DIV / 1.5 DIV EXT / 50 mV / 150 mV	←	(DC to 10 MHz (10 MHz to 60 MHz	←
AUTO mode	Frequency / 30 to 100 Hz / 100 Hz to 20 MHz / 20 to 100 MHz INT / 1.5 DIV / 1 DIV / 1.5 DIV EXT / 150 mV / 100 mV / 150 mV	←	(30 to 100 Hz (100 Hz to 10 MHz (10 to 60 MHz	←
TV mode	Sync signal Internal sync : 1 div or more External sync : 200 mVp-p or more	←	←	←
Trigger level	Variable range AUTO: Automatically corresponds to the trigger signal NORM: INT : ±4 DIV or more EXT : ±0.4 V or more EXT÷10: ±4 V or more	← ← ← ←	← ← ← ←	← ← ← ←
Slope	±	←	←	←

	V-1065	V-1060	V-665	V-660
External input impedance	1 M ohms ±5%, 25pF + 6pF	←	←	←
External input voltage	400 V (DC + AC peak) at 1 kHz	←	←	←
Sweep time				
A(main) sweep	50 ns/DIV to 0.5 s/DIV	←	←	←
	Continuously variable (UNCAL)	←	←	←
B(delay) sweep	50 ns/DIV to 50 ms/DIV	←	←	←
Accuracy	<table><tr><th></th><th>10 to 35°C</th><th>0 to 50°C</th></tr><tr><td>X1</td><td>±3%</td><td>±4%</td></tr><tr><td>MAG X10</td><td>±4%</td><td>±6%</td></tr></table>	←	←	←
Sweep magnification	X10	←	←	←
Maximum sweep rate	5 ns/DIV	←	←	←
Hold off time	Variable	←	←	←
Delay time	1 µs to 5 s	←	←	←
Delay jitter	1/20,000 or less	←	←	←
Alternate separation	Variable	←	←	←
Trigger lock function	Provided	←	←	←
Auto range function	Provided	←	←	←
Single sweep function	Provided	←	←	←
o Readout function				
Panel setting display	Vertical axis : V/DIV (CH1, CH2), UNCAL, probe conversion	Not provided	Same as V-1065	Not provided
	Sweep speed : S/DIV, UNCAL, MAG (converted value)	←	←	←
	Other : Delay time	←	←	←
o Cursor readout function	Voltage difference ΔV : Δ-REF Time difference ΔT : Δ-REF Frequency 1/ΔT : Δ-REF	No cursor	Same as V-1065	No cursor

	V-1065	V-1060	V-665	V-660
o External output				
TRIGGER SIGNAL OUT	Output voltage : 25 mV/DIV approx. (Full scale on the CRT) 50-ohm termintation Frequency response: DC to 10 MHz Output impedance : 50 ohms approx.	Not provided	Same as V-1065	Not provided
o Calibrator				
Waveform	1 kHz ±20%, square wave	←	←	←
Voltage	0.5 V ±1%	←	←	←
o Power supply	90 V to 250 V AC, 48 to 440 Hz, 40 W approx.	←	←	←
o Others				
Dimensions	275(W) x 130(H) x 360(D) mm approx. (10.8(W) x 5.1(H) x 14.2(D) in. approx.)	←	←	←
Weight	6 kg approx. (13.2 lb. approx.)	←	←	←
Ambient temperature	Operating : 0 to 50 °C (32 to 122 °F) Safe operating : 10 to 35 °C (50 to 95°F) Storage : -20 to 70°C (-4 to 158°F)	← ← ←	← ← ←	← ← ←
Humidity	Operating mode : 35 to 85% Non-operating mode : 45 to 85%	← ←	← ←	← ←
EMI	VDE0871, Category B	←	←	←

2. ACCESSORIES

The V-1065/V-1060/V-665/V-660 Oscilloscopes are shipped with the following standard accessories:

2 Probes (AT-10AP1.5)
1 AC Power Cord
1 Operation Manual
1 Fuse (2A)
1 Dust Proof Cover

3. PREVENTIVE MAINTENANCE

Preventive maintenance, when performed on a regular basis, can prevent instrument breakdown and may improve the reliability of the oscilloscope. The severity of environment to which this instrument is subjected will determine the frequency of maintenance. A convenient time to perform preventive maintenance is preceding recalibration of the instrument.

Disassembly

Remove the top cover and the bottom cover of the instrument. Most of the internal parts of the instrument are now accessible. If access to the front of the circuit boards are necessary, remove the knobs from the external control shafts on the board.

Cleaning

The instrument should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause component breakdown.

The covers provide protection against dust in the interior of the instrument. Loose dust accumulated on these covers can be removed with a soft cloth or small brush.

Dirt that remains can be removed with a soft cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used. Cleaning the interior should only be occasionally necessary. The best way to clean the interior is to blow off the dust with a dray, low-velocity stream of air. A soft-bristle brush or a cotton-tipped applicator is useful for cleaning in narrow spaces or for cleaning more delicate components.

Visual Inspection

The instrument should be inspected occasionally for such defects as broken connections, improperly seated transistors, damaged circuit boards, and heat-damaged parts. The corrective procedure for most visible defects is apparent; however, particular care must be taken if heat-damaged components are found. Overheating usually indicates other trouble in the instrument; therefore, correcting the cause of the overheating is important to prevent recurrance of the damage.

4. CALIBRATION

Hitachi Denshi provides complete instrument repair and calibration. Contact your local Hitachi Denshi office or representative.

4.1 Calibration interval

To maintain instrument accuracy, perform the calibration of the V-1065/V-1060/V-665/V-660 at least every 1000 hours of operation or every six months if used infrequently.

4.2 Test equipment required

The test equipment and accessories listed in Table 4-1 or equivalent are required to perform the calibration of the V-1065/V-1060/V-665/V-660. The minimum specifications required for accurate calibration are also listed. All the test equipment is assumed to be correctly calibrated and operate properly within the listed specifications. It is recommended to use the test equipment which exceeds the listed specifications. Operating instructions for the test equipment are not given in this procedure. Refer to the instruction manual for the test equipment for more information.

4.3 Preliminary procedure

This instrument should be calibrated at an ambient temperature of +20°C (±5°C) for the best overall accuracy.

1. Connect the instrument to AC line voltage, 50 Hz to 400 Hz line source.
2. Set the instrument controls as given in the Preliminary Control Settings. Allow at least fifteen minutes of warmup before proceeding.
3. See the Adjustment Locations in Section 6.

Table 4-1
TEST EQUIPMENT AND ACCESSORIES REQUIRED

	Description	Specifications	Applications	Examples of Applicable Test Equipment
1.	Constant Amplitude Signal Generator	Reference frequency: 50 kHz, Maximum frequency: 150 MHz, Amplitude: variable	Check horizontal, vertical and trigger bandwidths.	TEKTRONIX (R) SG503
2.	Standard amplitude Calibrator	Amplitude accuracy: 0.25%, Variable amplitude: 5 mV to 40 V, Frequency: 1 kHz square wave	Check horizontal and vertical gains.	TEKTRONIX PG506
3.	Square-wave Generator	Variable frequency: 10 Hz to 1 MHz, Output amplitude: 10 mV to 100 V	Check probe and vertical compensation.	TEKTRONIX PG506
4.	Digital Multimeter	Accuracy: 0.1%	Check power supply.	TEKTRONIX DM501A
5.	Digital Frequency Counter	Accuracy: 0.1%	Check CAL frequency.	
6.	Time Mark Generator	Accuracy: 0.1%	Check sweep time.	TEKTRONIX TG501
7.	Cable	Impedance: 50 ohms, Type: RG-58/U, Length: 42 inches, Connectors: BNC	This cable is used for almost all adjustment.	Hitachi Part No. 4202
8.	Termination	Impedance: 50 ohms, Connectors: BNC Feed through	Check vertical amplifier compensation.	
9.	Attenuator	Ratio: 10X, Connectors: BNC, Impedance: 50 ohms	Check vertical amplifier bandwidth.	
10.	T-Connector	Connectors: BNC	Check X-Y operation.	Hitachi Part No.1301

4.4 Preliminary control settings

Set the instrument controls as follows, when starting the calibration procedures.

Controls		Setting
POWER		OFF
FOCUS		Midrange
TRACE ROTATION		Any position
INTEN		CCW
READOUT INTEN		CCW
V. POSITION	CH1	Midrange
	CH2	Midrange
V. VAR	CH1	CW (CAL)
	CH2	CW (CAL)

Controls		Setting
AC-DC	CH1	Any position
	CH2	Any position
GND	CH1	GND
	CH2	GND
SELECTOR		Any position
VARIABLES		Any position
TIME/DIV		Any position
H MODE		A
V MODE		CH1

Note:

CW: Clockwise

CCW: Counterclockwise

H MODE: Horizontal mode

V MODE: Vertical mode

After completion of the above settings, turn the POWER control to ON, and set the INTEN and READOUT INTEN controls to any position.

4.5 Initial starting procedure

1. Turn instrument POWER on.
2. Allow a few seconds for the cathode ray tube (CRT) to warm up. A trace will appear on the display of the CRT.
3. If trace does not appear, increase the intensity by the INTEN control clockwise rotation until the trace is easily observed.

4. Adjust FOCUS control for optimum focus.
5. Adjust POSITION controls to center the trace if necessary.

POWER SUPPLY

(1) +12 V ADJ RV1506 (PEF-784)

Measure the voltage on pin 3 of connector P1501 on the PEF-784 board with a digital voltmeter, and adjust RV1506 so that the voltage is +11.975 to +12.025 V.

(2) CRT BIAS RV1042 (PEF-784)

a. Set:

MODE:	CH1
SOURCE OR X :	CH2
GND (CH1, CH2):	ON (Push-in)
H MODE:	X-Y (Simultaneously push ALT and B.)
SELECTOR:	H POS
EXT INPUT (for X signal):	No signal

b. Position a spot at the center on the CRT screen by the CH1 POSITION (vertical position and the VARIABLES controls.)

Note: When the SELECTOR selects H POS, the VARIABLES control is used as a horizontal position control.

c. Adjust the INTEN control so that the voltage on A OUT CHECK on the PEF-784 board is +15 V.

d. Adjust CRT BIAS control RV1042 just before the spot starts to appear on the screen.

e. Adjust the INTEN control and verify that the spot starts to appear within the range (as illustrated below.)

INTEN

③ TRACE ROTATION RV1606 (Front panel)

a. Set:

TIME/DIV:	A: 1 ms
H MODE:	A
V MODE:	CH1

b. Adjust the horizontal position until the left end of the trace is lined up with the center of the leftmost vertical graticule line on the screen.

c. Adjust the TRACE ROTATION control on the front panel so that the trace is parallel with the horizontal graticule line.

d. Repeat b and c alternately until the trace is aligned with the center horizontal graticule line.

④ ASTIG RV1281 (PEF-784)
FOCUS RV1607 (Front panel)

a. Set:

CH1 GND:	ON (Push-in)
CH2 GND:	ON (Push-in)
H MODE:	X-Y (Simultaneously push ALT and B.)
SOURCE OR X:	CH1
BW LIMIT:	ON

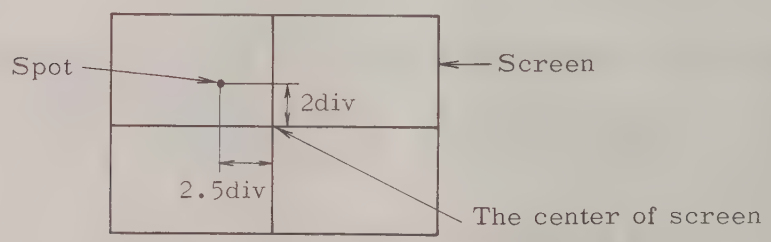
b. Locate a spot as illustrated in the following figure.

c. Adjust INTEN control RV1601 (Front panel) just before halation starts to occur.

d. Rotate FOCUS control RV1607 (Front panel) fully clockwise.

e. Adjust ASTIG control RV1281 (PEF-783) so that the spot is a circule as true as possible.

f. Adjust FOCUS control RV1607 (Front panel) to obtain the smallest spot.



(5) FOCUS CENT RV1253 (PEF-784)

a. Perform adjustment (4) .

b. Set the FOCUS control to the mechanical mid-position.

c. Adjust FOCUS CENT control RV1253 (PEF-784) to obtain the samllest spot.

HORIZONTAL

Press AUTO of the TIME/DIV switch while holding the SELECTOR downward(▼) so that the sweep circuit operation is initialized. Then, proceed the following adjustment. (The adjustment in the X-Y mode is simultaneously performed.)

⑥ H GAIN RV834 (PEF-782)

a. Set:

CH2 AC/DC:	AC
CH2 VOLTS/DIV:	10 mV (CAL)
H MODE:	X-Y
V MODE:	CH1
SOURCE OR X:	CH2
CH1 GND:	GND (Push-in)

b. Connect a 50 mV square wave to the CH2 INPUT connector.

c. Adjust H GAIN control RV834 (PEF-782) so that the distance between the spots on the CRT is 5 div.

⑦ 1 ms/div ADJ RV801 (PEF-782)

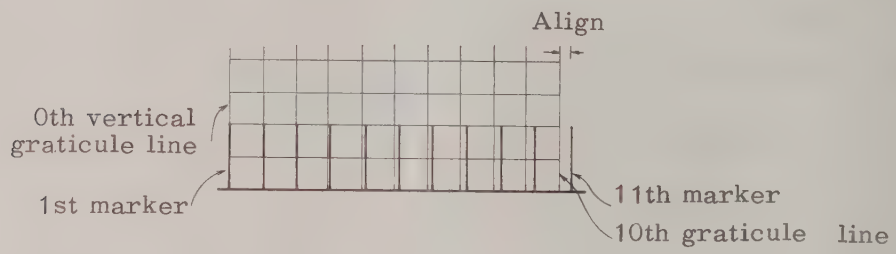
a. Set:

V MODE:	CH1
CH1 AC/DC:	DC
H MODE:	A
A TIME/DIV:	A = 1 ms
CH1 input:	1 ms time mark signal from a time mark generator
INTEN:	As required
READOUT INTEN:	As required
x10 MAG:	OFF

b. Align the 1st time marker with the zeroth (leftmost) vertical graticule line.

Note: This adjustment is performed by moving the horizontal position by the VARIABLES control with H POS selected by the SELECTOR.

c. Adjust 1 ms/div ADJ control RV801 (PEF-782) so that the 11th time marker is aligned with the 10th (rightmost) vertical graticule line.



(8) x10 MAG GAIN RV844 (PEF-782)

a. Set:

V MODE:	CH1
CH1 AC/DC:	DC
H MODE:	A
CH1 input:	1 ms from the time mark generator
INTEN:	As required
REDOUT INTEN:	As required
x10 MAG:	ON
A TIME/DIV:	A * 0.1 ms (since the x10 MAG control is ON)

b. Align the 1st time marker with the zeroth (leftmost) vertical graticule line.

c. Adjust MAG GAIN control RV844 (PEF-782) so that the 11th time marker is aligned with the 10th (rightmost) vertical graticule line.

(9) MAG CENT RV831 (PEF-782)

a. Set:
Same as adjustment (8) - a.

b. Adjust the horizontal position, and align the rising portion of the 2nd time marker with the center vertical graticule line (6th line from the left).

c. Adjust MAG CENT control RV831 (PEF-782) so that the above 2nd time marker is not displaced from the center vertical graticule line when the X10 MAG switch is set to off.

(10) H POS START RV807 (PEF-782)

a. Set the POWER switch to OFF first, and then turn it back to ON. At this time, leave the controls on the front panel as they are.

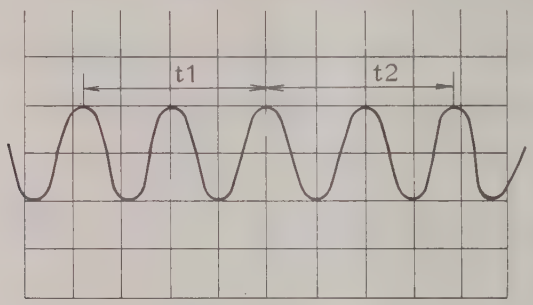
b. Adjust H POS START RV807 (PEF-782) so that the start point of the sweep is aligned with the leftmost graticule line.

(11) 5 ns CV859 (PEF-784)

a. Set:A TIME/DIV: A = 50 ns
CH1 input: 10 ns (Fed from the time mark generator) (When the rate is 10 ns or more, a sinewave is supplied.)
H POS: Adjust so that the numbers of the peaks on either side of the center vertical graticule line are equal.
x10 MAG: ON

b. Adjust the H POS control so that the numbers of the peaks on either side of the center vertical graticule line are equal with the peak of the center wave aligned with the center vertical graticule line.

c. Adjust 5 ns CV859 (PEF-784) so that the time (t_1 and t_2) from the center vertical graticule line to the 2nd peaks on either side of the center line is equal.



VERTICAL

(12) CH1 DC BAL RV37 (PEF-781)

a. Set:

V MODE:	CH1
CH1 GND:	ON (Push-in)
CH1 VOLTS/DIV:	2mV
A TIME/DIV:	A = 1 ms
CH1 V POSITION:	Mid-position

b. Adjust CH1 DC BAL control RV37 (PEF-781) so that the displacement of the trace is within ±0.1 div when the CH1 VOLTS/DIV switch is switched between 2mV and 10 mV.

(13) CH2 DC BAL RV137 (PEF-781)

a. Set:

V MODE:	CH2
CH2 GND:	ON (Push-in)
CH2 VOLTS/DIV:	5 mV
A TIME/DIV:	A = 1 ms
CH2 V POSITION:	Mid-position

b. Adjust CH1 DC BAL control RV137 (PEF-781) so that the displacement of the trace is within ±0.1 div when the CH2 VOLTS/DIV switch is switched between 5 mV and 10 mV.

(14) CH2 POS CENT RV162 (PEF-781)

a. Set:

V MODE:	DUAL
V POSITION: (CH1, CH2)	Mid-position
GND (CH1, CH2):	ON (Push-in)
A TIME/DIV:	A = 0.1 ms

b. Adjust CH2 POS CENT control RV162 (PEF-781) so that the trace does not move when CH2 INV control S1611 (PEF-783) is turned on and off.

(15) CH1 POS CENT RV62 (PEF-781)

a. Set:

V MODE:	DUAL
CH2 V POSITION:	As set in (14) - a.
CH2 GND:	ON (Push-in)

b. Adjust CH1 POS CENT control RV62 (PEF-781) so that the trace is aligned with the CH2 trace (See item (13)).

⑯ CHR Y CENT RV574 (PEF-785)

(1) V-1065, V-665 .... with cursors

a. Set:

Turn the POWER switch to OFF first, and then back to ON to initialize the microcomputer.

CHR INTEN: As appropriate
V MODE: CH1
CH1 VOLTS/DIV: 10 mV
(H MODE: A)
SELECTOR: ΔV of MEASURE

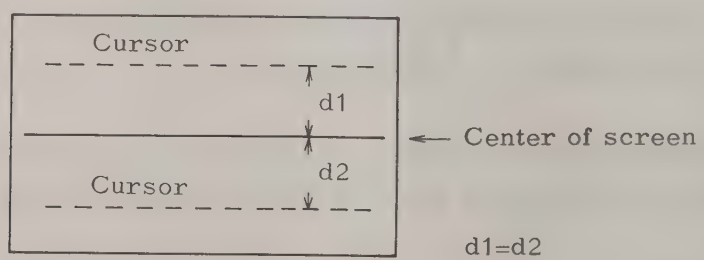
When power is turned on, H POS is automatically set. Consequently, when the SELECTOR switch is lowered one step further, MEASURE is selected (the LED lights) and ΔV is displayed on the screen.

(If the SELECTOR switch is lowered one more step, ΔT is displayed on the screen with the MEASURE LED lit. If the switch is lowered one more step, 1/ΔT is displayed on the screen.)

VARIABLES: Do not touch to avoid a possible movement of the cursors.

b. Verify that the "ΔV= +600 mV" is displayed at the top left of the screen.

c. Adjust CHR Y CENT RV574 (PEF-785) so that the cursors are at the same distance from the center of the screen.



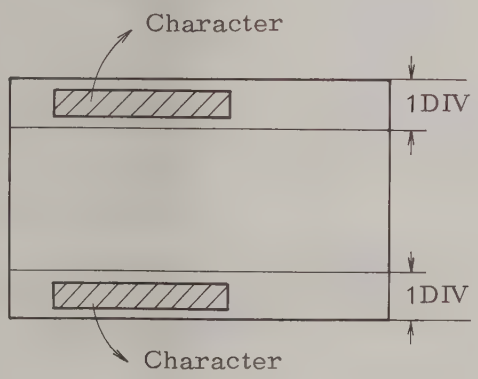
(2) V-1060, V-660 .... without cursor

a. Set:

READOUT INTEN: As appropriate
V MODE: CH1
H MODE: ALT

When the H MODE is set to ALT, A sweep and B sweep (delay sweep) are displayed, and characters are displayed at the top and bottom of the screen.

b. Adjust CHR Y CENT RV574 (PEF-785) so that the characters displayed are within 1 DIV of the top and bottom positions and at the center of each area.



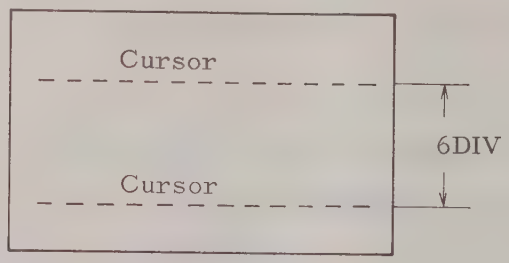
⑰ CHR Y GAIN RV576 (PEF-785)

(1) V-1065, V-665 .... with cursors

a. Set:

Same as ⑯ (1)

b. Adjust CHR Y GAIN RV576 (PEF-785) so that the distance between the two cursors is 6 div.

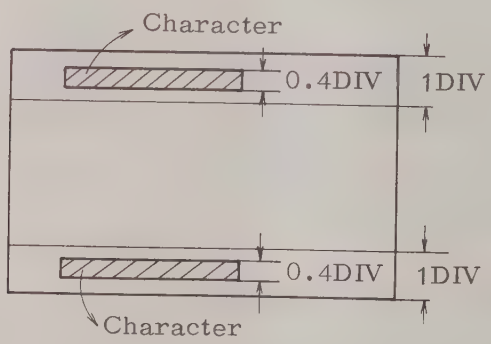


(2) V-1060, V-660 .... without cursors

a. Set:

Same as (16) (2)

b. Adjust CHR Y GAIN RV576 (PEF-785) so that the height of characters is 0.4 div.



(18) CHR Y CENT RV574 (PEF-785)

Since the CHR Y GAIN adjustment is related to the CHR Y CENT adjustment, adjust the CHR Y CENT adjustment described in (16) again.

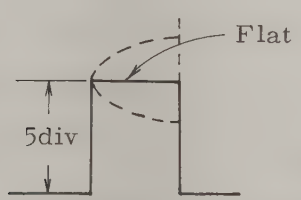
⑲ CH1 DC GAIN RV30 (PEF-781)

a. Set:

VERT MODE:	CH1
CH1 VOLTS/DIV:	10 mV/DIV
TIME/DIV:	A =. 1 ms
CH1 AC-DC:	DC
CH1 input:	1 kHz, 50 mVp-p square wave (from the Tektronix's pulse generator PG-506 or equivalent) Set the PG-506 in the FAST RISE mode and connect the output (1 kHz square wave) in the 50-ohm termination. (In the FAST RISE mode, a waveform with a flat top is ensured.

b. Adjust the pulse generator so that the amplitude of the square wave is appprox. 5 div at the center on the screen. (50-ohm terminated)

c. Adjust CH1 DC GAIN control RV30 (PEF-781) so that the square wave is flat at top.



⑳ CH2 DC GAIN RV130 (PEF-781)

a. Set:

VERT MODE:	CH2
CH2 VOLTS/DIV:	10mV/DIV
A TIME/DIV:	A = 2 ms
CH2 AC/DC:	DC
CH2 input:	Same as CH1 input ⑲ or equivalent

b. Adjust the pulse generator so that the amplitude of the square wave is approx. 5 div on the screen.

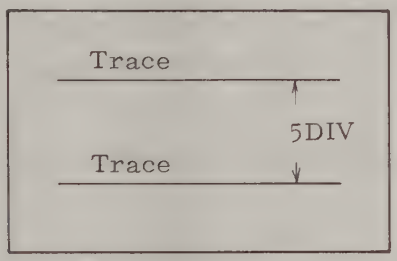
c. Adjust CH2 DC GAIN control RV130 (PEF-781) so that the square wave is flat at top.

㉑ V GAIN RV502 (PEF-785).... Total gain control common to CH1 and CH2

a. Set:

MODE:	CH2
SOURCE or X:	EXT DC÷10
TRIG MODE:	AUTO (Free-running scan) Normally free-running scan is performed in the AUTO mode unless the trigger level is at the fringe of triggering. If the free-running scan is not performed, adjust the TRIG LEVEL control.
CH1 VOLTS/DIV:	10 mV
A TIME/DIV:	A = 0.1ms
CH1 input:	1 kHz, 50 mVp-p square wave for calibration (from PG-506 on equivalent) (50-ohm termination open)

b. Adjust V GAIN control RV502 (PEF-785) so that the amplitude of the square wave is 5 div at the center on the screen.

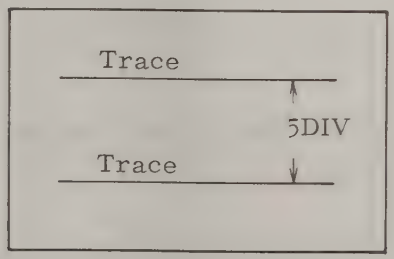


(22) CH2 GAIN control RV133 (PEF-781)

a. Set:

MODE:	CH1
SOURCE OR X:	CH2
TRIG MODE:	AUTO (Free-running trace)
CH2 VOLTS/DIV:	10 mV
A TIME/DIV:	A = 0.1ms
CH2 input:	Same as CH1 input (21)

b. Adjust CH2 GAIN control RV133 (PEF-781) so that the amplitude of the square wave is 5 div at the center on the screen.



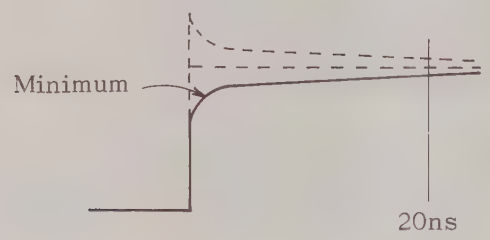
(23) CH1 HF COMP CV517, CV556, CV515 (PEF-785)

a. Set:

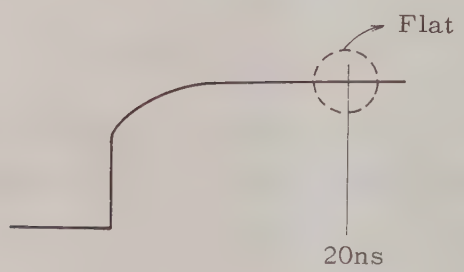
V MODE:	CH1
CH1 AC/DC:	DC
CH1 VOLTS/DIV:	10 mV/DIV

CH1 input: Tektronix's pulse generator PG506 or equivalent when the PG506 is in the FAST RISE mode, a square wave (Tr≦1 ns) is obtained. Connect this signal to CH1 in 50-ohm termination.

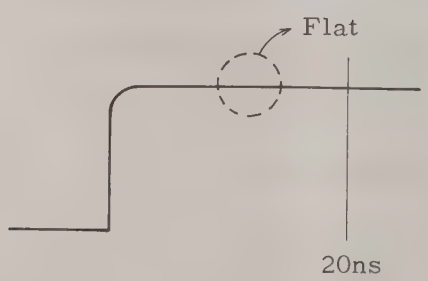
b. Adjust CV517 so that the amplitude around the rising edge is minimum.



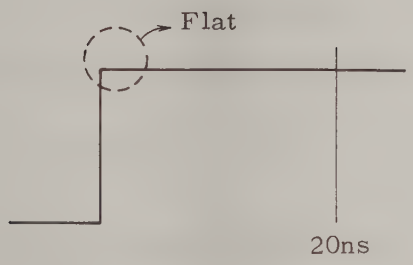
c. Adjust CV515 so that the portion near 20 ns is flat.



d. Adjust CV556 so that the midway point between the rising edge and 20 ns is flat.



e. Adjust CV517 so that the portion near the rising edge is flat.

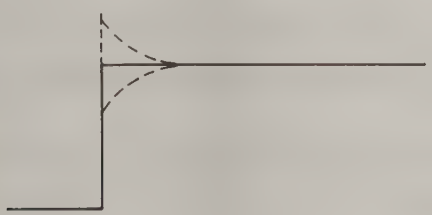


(24) CH2 HF COMP CV160 (PEF-781)

a. Set:

V MODE:	CH2
CH2 AC/DC SW:	DC
CH2 VOLTS/DIV:	10 mV
CH2 input:	Same as CH1 input (24)

b. Adjust CV160 (PEF-781) so that the rising portion is flat.



(25) CH1 ATT CV4, CV5, CV14, CV15 (PEF-781)

(1) Attenuation characteristics

Connect the output of the PG-506 directly to CH1.

a. Set:

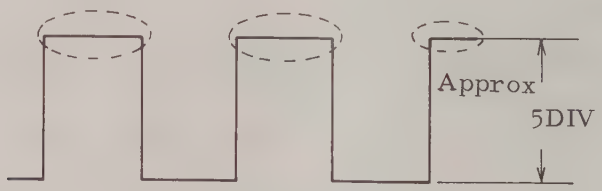
V MODE: CH1

CH1 input: Place the PG-506 in the HIGH AMPLITUDE range and connect the output (10 kHz square wave) to CH1.

b. Set CH1 VOLTS/DIV to 0.1 V. (CH1 ATTN is set to ÷10.)

c. Adjust the output amplitude control of the PG-506 so that the amplitude of the waveform is approx. 5 DIV.

d. Adjust CV5 (PEF-781) so that the top of the waveform is as flat as possible.



e. Set CH1 VOLTS/DIV to 1 V. (CH1 ATTN is set to ÷100.)

f. Adjust the output amplitude control of the PG-506 so that the amplitude of the waveform is approx. 5 DIV.

g. Adjust CV15 (PEF-781) so that the top of the waveform is as flat as possible.

(2) Input capacitance

Connect the output of the PG-506 to CH1 by a 10:1 probe.

a. Set:

V MODE:	CH1
CH1 input:	Place the PG-506 in the HIGH AMPLITUDE range and connect the output (10 kHz square wave) to CH1 by the 10:1 probe.

b. Same as b of (1).

c. Same as c of (1).

d. Adjust CV4 (PEF-781) so that the top of the waveform is as flat as possible.

e. Same as e of (1).

f. Adjust the output amplitude adjustment of the PG-506 so that the amplitude of the waveform is 1 to 2 DIV on the screen.

g. Adjust CV14 (PEF-781) so that the top of the waveform is as flat as possible.

(26) CH2 ATT CV104, CV105, CV114, CV115 (PEF-781)

Same as (25) except that the V MODE input and the VOLTS/DIV settings are changed to CH2.

CV104 corresponds to CV4 of (25).
CV105 corresponds to CV5 of (25).
CV114 corresponds to CV14 of (25).
CV115 corresponds to CV15 of (25).

(27) TRIG SIG OUT DC LEVEL RV320 (PEF-781)

a. Set:

SOURCE OR X:	CH1
CH1 GND:	ON (Push in)

b. Connect the digital voltmeter or the oscilloscope to TRIG SIGNAL OUT J301.

c. Adjust RV320 (PEF-781) so that the output voltage is zero volts.

The following procedures ((28) , (29) and (30)) are needed for the adjustment of the frequency response of the amplifier in the TRIG system.

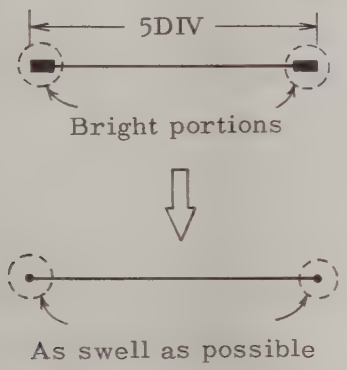
(28) INT HF COMP CV305 (PEF-781)

a. Set:

H MODE:	X-Y
SOURCE OR X:	CH1 (The signal connected to CH1 enters the X-AMP.)
V MODE:	CH2 (To prevent beam from deflecting in the vertical direction, the no-signal CH2, not CH1 with the signal connected, is selected.)
CH1 VOLTS/DIV:	10 mV
CH1 input:	When the PG-506 is in the FAST RISE mode, a 10 kHz square wave (10KHz) is obtained. Connect this signal to CH1 in 50-ohm termination.

b. Adjust the output control of the PG-506 so that the trace of approx. 5 DIV is displayed in the horizontal direction of the screen.

c. Adjust INT HF COMP CV305 (PEF-781) so that both ends of the trace is as small as possible.



(29) EXT 1/1 HF COMP CV306 (PEF-781)

a. Set:
SOURCE OR X: EXT DC
EXT INPUT input: Same as CH1 input of (28)

b. Same as b of (28)

c. Adjust EXT 1/1 HF COMP CV306 (PEF-781) so that both ends of the trace are as small as possible.

(30) EXT 1/10 HF COMP CV307 (PEF-781)

a. Set:
SOURCE OR X: EXT DC ÷ 10
Other settings are the same as (29) .

b. Adjust the output control of the PG-506 so that the trace of approx. 5 DIV is displayed in the horizontal direction on the screen.

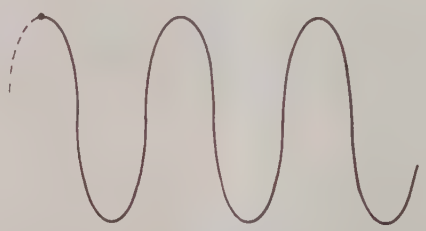
c. Adjust EXT 1/10 HF COMP CV307 (PEF-781) so that both ends of the trace are as small as possible.

(31) TRIG (+) PEAK RV685 (PEF-782)

a. Set:

SOURCE OR X:	CH1
V MODE:	CH1
TRIG MODE:	A = 20 μs
CH1 VOLTS/DIV:	10 mV or 20 mV
SLOPE:	(+)
TRIG LEVEL:	CW
CH1 input:	Square wave of approx. 50 kHz (4 DIV amplitude on screen)

b. The trigger point is changed as shown in dotted lines by the TRIG (+) PEAK control. Adjust TRIG (+) PEAK RV685 (PEF-782) so that the trace is triggered at as high a point as possible.



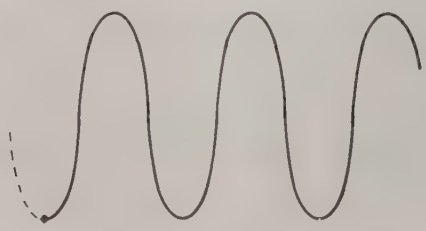
(32) TRIG (−) PEAK RV675 (PEF-782)

a. Set:

SLOPE:	(−)
TRIG LEVEL:	CCW

Other settings are the same as (31).

b. Adjust TRIG (−) PEAK RV675 (PEF-782) so that the trace is triggered at as low a point as possible.



External output

(33) PROBE ADJ RV1303 (PEF-785)

Measure the PROBE COMP output at J502 by the digital voltmeter, and adjust PROBE ADJ RV1303 (PEF-785) for 0.250 V.

CHR X

(34) CHR X CENT RV876 (PEF-782)

(1) V-1065, V-665 .... with cursors

a. Set:

Turn the POWER switch to off first, and then back to on to initialize the microcomputer.

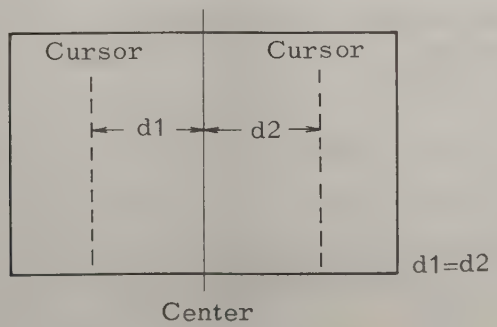
READOUT INTEN: As appropriate

SELECTOR: ΔT of MEASURE (Refer to SELECTOR of (16) a.)

VARIABLES: Do not move.

b. Verify that "8000 ms" is displayed on the top left of the screen.

c. Adjust CHR X CENT RV876 (PEF-782) so that the distances between the center of the screen and the cursors are equal.

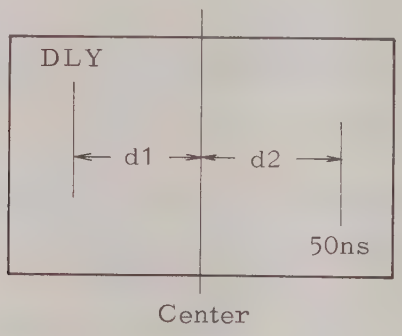


(2) V-1060, V-660 .... without cursors

a. Set:

READOUT INTEN: As appropriate
V MODE: CH1
H MODE: ALT
B TIME: B = 50 ns
Other settings are the same as (1).

b. Adjust CHR X CENT RV876 (PEF-782) so that the positions of the characters on the screen are as illustrated below.

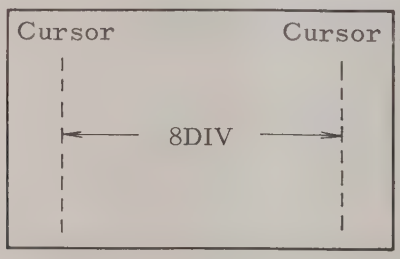


(35) CHR X GAIN RV884 (PEF-782)

(1) V-1065, V-665 .... with cursors

a. Set: Same as (34) (1).

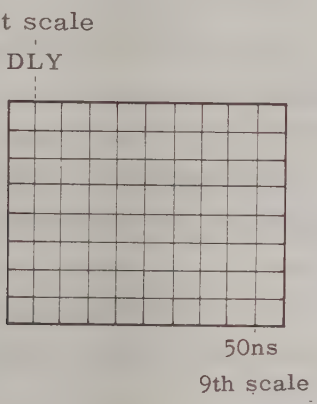
b. Adjust CHR X GAIN RV884 (PEF-782) so that the distance between cursors is 8 DIV.



(2) V-1060, V-660 .... without cursors

a. Set: Same as (34) (2).

b. Adjust CHR X GAIN RV884 (PEF-782) so that the positions of the characters are as illustrated below.



c. Perform the adjustment (34) again, since the result of the adjustment (34) is deviated by the adjustment (35).

NOTE

When the power switch of this instrument is turned on, the time base calibration and the diagnosis of the sweep circuit operation are performed by the built-in microcomputer.
If the result is normal, "CALIBRATION-COMPLETED" is displayed on the CRT 20 seconds after the power has been turned on, and the instrument is placed in the standard state.
If the result is not normal, "CALIBRATION-FAILED AT SWEEP CKT (or CYCLE CKT)" is displayed. When the power switch is turned on after storage in a low temperature, allow several minutes until circuits become stable. Then turn off the power switch and turn on the switch again.
If "CALIBRATION-COMPLETED" is displayed, the operation is normal. If "CALIBRATION-FAILED AT SWEEP CKT" is displayed again, check the sweep circuit (PEF-782 or PEF-837.)

5. DETAILED CIRCUIT DESCRIPTION

5.1 VERTICAL CIRCUIT (◇1, ◇2 1/2, ◇3 1/3, ◇9 1/4)

The detailed block diagram of this circuit is shown in Fig. 5-1. This circuit consists of the CH1 vertical circuit and the CH2 vertical circuit. These circuit configurations are almost identical. The CH1 SIG fed to J1 is routed to the CH1 INPUT COUPLING circuit, and the input-coupling modes are selected by switches S1 and S11 to AC, GND, or DC. The CH1 SIG is then fed to the CH1 1ST ATTENUATOR, and its signal level is attenuated to 1/1, 1/10 or 1/100. The attenuated CH1 SIG is fed to the CH1 INPUT AMP, and its impedance is converted (high input impedance and low output impedance).
The AC component of the CH1 SIG flows from C20 to TR25 to TR40 to TR41 to TR42, while the DC component flows from R21 to IC26 to TR28 to TR40 to TR41 to TR42.
IC26 is a DC amplifier. TR28 is a common-base transistor, and separates the AC component from the DC component to prevent them from being loaded to each other. Further, TR28 makes the load impedance of TR25 (FET) high and makes the gain of the FET 1.

When an input is zero volts, an output should also be zero volts. However, even if an input is zero volts, some offset voltage appears at the output of an actual DC amplifier.
CH1 DC BAL RV37 compensates for an offset voltage of IC26. CH1 DC GAIN RV30 changes the amount of the DC feedback, controls the DC gain, and matches the DC gain to the AC gain.
Diodes D23, D25, and D26 protect the INPUT AMP against an excessive input voltage.
The voltage gain of the INPUT AMP is 2.5 times, but it is switched to 6.25 times by switch S2-3 at the 2 mV/div range.
The output of the CH1 INPUT AMP is fed to the CH1 2ND ATTENUATOR, its signal level is attenuated to 1/1, 1/2, 1/4 or 1/10 by the setting position of the VOLTS/DIV switch. The output impedance is always 150 Ω.

The PANEL STATUS (1) is a circuit for transmitting the setting state of the VOLTS/DIV switch to a microcomputer. This circuit is provided in the V-1065 and the V-665 only .
The relationship between the overall gain and the setting position of the VOLTS/DIV switch is shown in Table 5-1.

Table 5-1

VOLTS/ DIV	1ST ATTN	INPUT AMP Gain	2ND ATTN	Overall Gain	VOLTS/DIV x Overall Gain
2 mV	1	6.25(x2.5)	1	6.25	12.5 mV/div
5 mV	1	2.5	1	2.5	12.5 mV/div
10 mV	1	2.5	0.5(÷2)	1.25	12.5 mV/div
20 mV	1	2.5	0.25(÷4)	0.625	12.5 mV/div
50 mV	1	2.5	0.1(÷10)	0.25	12.5 mV/div
0.1 V	0.1(÷10)	2.5	0.5(÷2)	0.125	12.5 mV/div
0.2 V	0.1(÷10)	2.5	0.25(÷4)	0.0625	12.5 mV/div
0.5 V	0.1(÷10)	2.5	0.1(÷10)	0.025	12.5 mV/div
1 V	0.01(÷100)	2.5	0.5(÷2)	0.0125	12.5 mV/div
2 V	0.01(÷100)	2.5	0.25(÷4)	0.00625	12.5 mV/div
5 V	0.01(÷100)	2.5	0.1(÷10)	0.0025	12.5 mV/div

At the CAL position of the CH1 VAR control, R52 is shorted. At the fully CCW position, the output of the CH1 INPUT AMP becomes less than 1/2.5 times the output at the CAL mode.
The CH1 SIG from the CH1 2ND ATTENUATOR is fed to the CH1 V.PREAMP, where the signal is converted from the single-ended signal to the paraphase signal, and then fed to the DIODE GATE 1 at the next stage.
The DC voltage at the TR58 base is changed by CH1 POS RV1604 in the circuit ◇9◇, and the vertical position of the CH1 SIG is changed.

TRIGGER PICKOFF

A part of the CH1 SIG from the CH1 2ND ATTENUATOR is fed to the TRIGGER PICKOFF(1), and becomes the CH1 TRIG SIG. The time constant of the output impedance of the TRIGGER PICKOFF(1) is equal to that of the feedback impedance of the TRIGGER AMP in the next stage (Fig. 5-2). Therefore, the impedance ratio of the two circuits is always constant independent of frequency.
The DIODE GATE 1 is controlled by the $\overline{\text{CH1 DSP}}$ signal from [7].
When the $\overline{\text{CH1 DSP}}$ signal is L, the CH1 SIG passes the DIODE GATE 1, and it is supplied to the DELAY LINE DRIVER at the next stage.
TR401 is a drive circuit of the DIODE GATE 1, and detects the operating state of CH1 (whether the CH1 SIG is in the state to be displayed or not).

TR407 is a stabilization circuit to prevent a shift of the DC level caused by the control switch.
In other words, TR407 changes the current flowing in TR407 according to the operating states of CH1 and CH2 to maintain the DC voltages at points (a) and (b) constant.
The CH2 SIG is fed to the DIODE GATE 2 via TR SW(1) or TR SW(2). The polarities of the input and output of TR SW(2) are opposite to those of TR SW(1).

When CH2 INV switch S1611 of ◇9◇ is switched to the INV side, the $\overline{\text{CH2 INV}}$ signal is pulled down by the resistor in invertor IC172, and turned to L. Then, each base of TR175 and TR176 goes H, and TR SW(2) (TR175 and TR176) turns to on. On the other hand, the TR SW(1) turns to off because the bases of TR171 and TR172 are L. Thus, the CH2 signal is fed to the DIODE GATE 2 via TR SW(2), and the display polarity is inverted.

The signal is then supplied to the DELAY LINE DRIVER. Because this driver circuit is a common-emitter voltage feedback circuit, the impedance of the input and the output is low.

The signal from the DELAY LINE is amplified by the V.AMP (1) consisting of TR501 and TR502 and the V.AMP (2) consisting of TR503 and TR504. GAIN RV505 adjusts the V. OUTPUT AMP so that its output is displayed corresponding to the deflection factor set by the VOLTS/DIV switch. Because the V.AMP (2) is a parallel feedback amplifier, the input impedance is small.

In case of the V-660, V-665, V-1060 and V-1065, the signal fed from [11] via the DIFF.AMP(1) is added between the V.AMP(1) and the V.AMP(2).

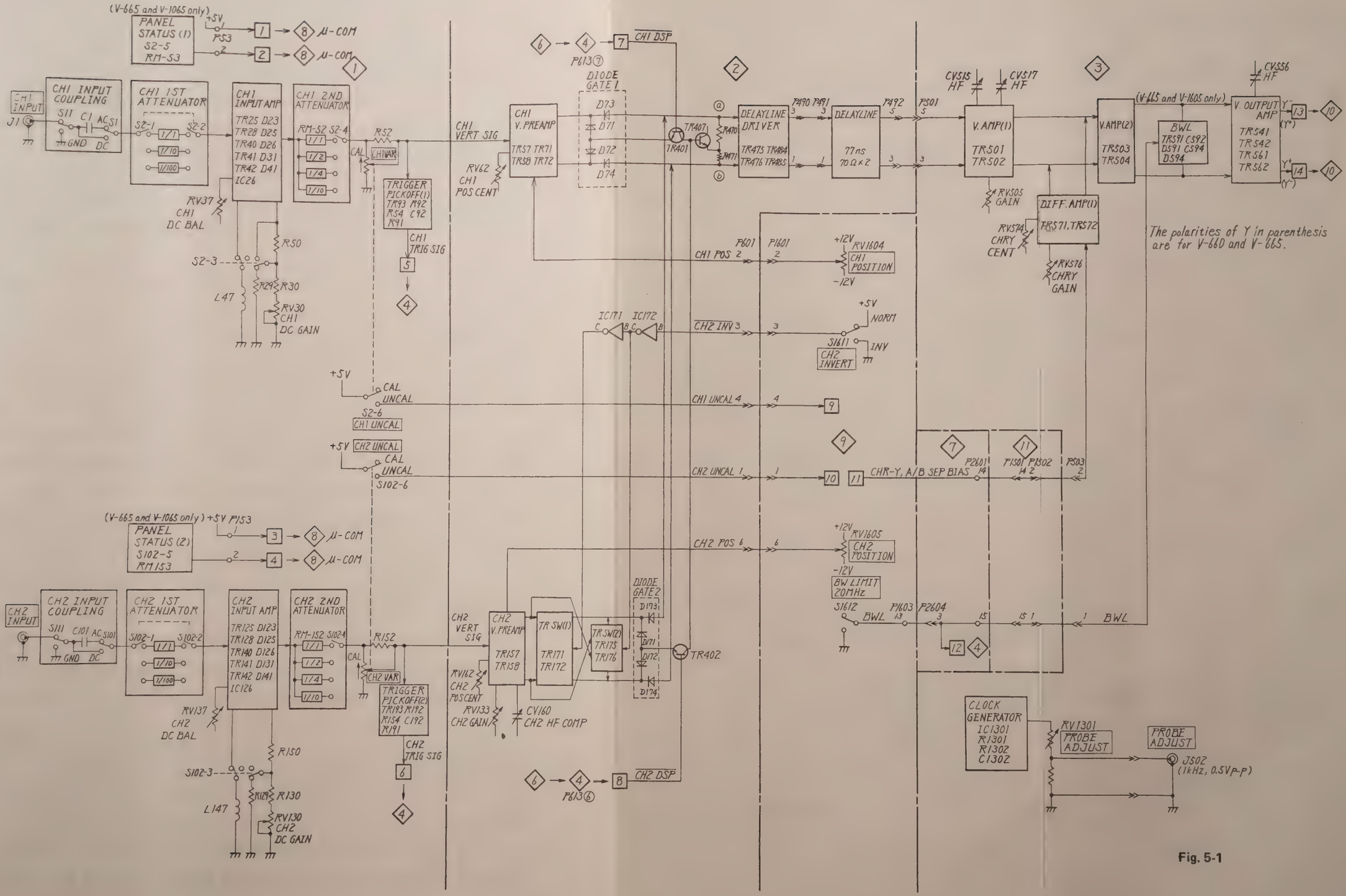
Normally approx. +1 V for the display of the waveform is fed from [11] , but the A/B SEP BIAS signal which is produced by adding some voltage to the DC voltage for the display of the waveform when the horizontal display is in the ALT sweep mode.

The CHR Y signal is fed at the timing when the characters are displayed on the CRT.

The DIFF.AMP (1) is a circuit for converting the single-ended signal into the paraphase signal.

The signal from the V.AMP (2) is fed to the cascode-V.OUTPUT AMP, and amplified up to the voltage required for the vertical deflection.

For the V-1065 and the V-1060, a band width limiter (BWL) circuit is provided between the V.AMP (2) and the V.OUTPUT AMP to attenuate the frequency of more than 20 MHz. For the V-665 and V-660, the frequency to be attenuated is 10 MHz or more.



The polarities of Y in parenthesis are for V-660 and V-665.

Fig. 5-1

5.2 CALIBRATOR (◇3 2/3)

As for this circuit, refer to Fig.5-1.
IC1301 is a clock generator, and its oscillation frequency is determined by R1301, R1302, and C1302.
The 2 kHz frequency oscillated by R1301, R1302 and C1302 is counted down to 2:1 by IC1301, and a symmetrical 1 kHz square waveform is fed out from pin 4 of IC1301.
The output level of IC1301 is adjusted by RV1303 so that the output from CAL J502 becomes 0.5 Vp-p.

5.3 TRIGGER CIRCUIT (◇2 2/2 , ◇3 3/3 , ◇9 2/4)

The detailed block diagram of this circuit is shown in Fig. 5-2. The trigger-coupling modes selected by TRIG OR X SOURCE are CH1, CH2, AC, DC, DC÷10, or LINE. The TRIG SIG is supplied from [5] in the CH1 mode, from [6] in the CH2 mode, from [14] in the LINE mode, and from EXT INPUT J301 in the other modes. The TRIG SIG from the TRIGGER COUPLING is fed to the TRIG AMP and is amplified to the fixed signal level. The polarities at the input and output of TRIGGER AMP are opposite. The AC component of the TRIG SIG flows from TR320 to TR325 to TR330, while the DC component flows from R320 to IC320 to TR325 to TR330. TRIG DC BAL RV320 adjusts the offset voltage of IC320, and the feedback impedance of the TRIGGER AMP consists of R350, R304, and CV305. As for the TRIGGER AMP, refer to TRIGGER PICKOFF in 5.1 VERTICAL CIRCUIT. The TRIG SIG from the TRIGGER AMP is supplied to the TRIGGER SHAPER, (+) PEAK DETECTOR, (-) PEAK DETECTOR, and AMP(1).

The TRIGGER SHAPER is a comparator with a hysterisis characteristics, and feeds out the trigger pulses to (1) and (2) by comparing the TRIG LEVEL set by TRIG LEVEL RV163 in ◇9 with the TRIG SIG. The polarities of the trigger pulses are opposite each other. The (+) PEAK voltage of the TRIG SIG is fed to (a) by the (+) PEAK DETECTOR, and the (-) PEAK voltage is fed to (d) by the

(-) PEAK DETECTOR. Therefore, the voltages at (a) and (d) are changed by the minimum and maximum voltages of the TRIG SIG. On the other hand, the positive fixed voltage is generated at (b), and the negative fixed voltage is generated at (e). The voltage at (a) or (b) is fed to (c), and the voltage at (d) or (e) is fed to (f). The supplied voltages are determined by TRIG MODE S690 in ◇3◇. When the TRIG MODE is at AUTO, the voltage at (a) (the positive peak voltage of the TRIG SIG) is fed to (c), and the voltage at (d) (the negative peak voltage of the TRIG SIG) is fed to (f). Therefore, it is possible to correspond the variable range of TRIG LEVEL RV163 in ◇9◇ with the amplitude of the trigger signal, and it is easy to set the trigger level.

When the TRIG MODE is at NORM, TV-V, or TV-H, the voltage at (b) (the positive fixed voltage not affected by the minimum and maximum voltages of the TRIG SIG) is fed to (c), and the voltage at (e) (the negative fixed voltage) is fed to (f). Therefore, the variable range of TRIG LEVEL RV163 in ◇9◇ is constant independent of the amplitude of the trigger signal. Information on the TRIG MODE selection is transmitted to the circuits ◇5◇ and ◇9◇ via INVERTER TR694.

AMP(1) is a negative feedback amplifier. The polarity of the TRIG SIG is inverted here. The inverted TRIG SIG is sent to the TV SYNC SEPARATOR, ◇5◇, and TRIG SIG OUT J302. In the SYNC SEPARATOR, the SYNC component of the TRIG SIG is separated regardless of the horizontal and vertical sync signals.

When the TRIG MODE is at AUTO or NORM, TR636 of TR SW(1) is on, the base of TR634 is grounded, and the TR SW(2) turns off. Therefore, the output of the TV SYNC SEPARATOR can not pass through the TR SW(2).

When the TRIG MODE is at TV-V or TV-H, the TR SW(1) is off, and the TR SW(2) turns on. Therefore, the output of the TV SYNC SEPARATOR can pass through the TR SW(2).

When the TRIG MODE is at TV-V, one side of C634 is grounded, and R634 and C634 compose an integrating circuit. As a result, the H

SYNC is interrupted, and only the V.SYNC passes through the TR SW(2).

The TRIGGER SLOPE SWITCH consists of the two current switch circuits. One consists of TR650 and TR651, and the other consists of TR652 and TR653.
When TRIG MODE S690 is at AUTO or NORM, +12 V is supplied to SLOPE S1610. When SLOPE S1610 is switched to the (+) SLOPE side, +12 V is supplied to the current switch circuit consisting of TR650 and TR651, and the voltage at (1) is fed out from the TRIGGER SLOPE SWITCH.

When the TRIG MODE is at AUTO or NORM and SLOPE S1610 is switched to (-) SLOPE side, +12 V is supplied to the current switch circuit consisting of TR652 and TR653, and the voltage at (2) is fed out from the TRIGGER SLOPE SWITCH. When the TRIG MODE is switched to TV-V or TV-H, +12 V is not supplied to any current switch circuit, and the voltage at neither (1) nor (2) is fed out from the TRIGGER SLOPE SWITCH. In this case, as stated above, the voltage at (3) (H.SYNC or V.SYNC) is fed out from [19] via the TR SW(2). Thus, one of the signals (1), (2), and (3) is fed out from [19] as a TRIG PULSE by the combination of TRIG MODE S690 and SLOPE S1610.

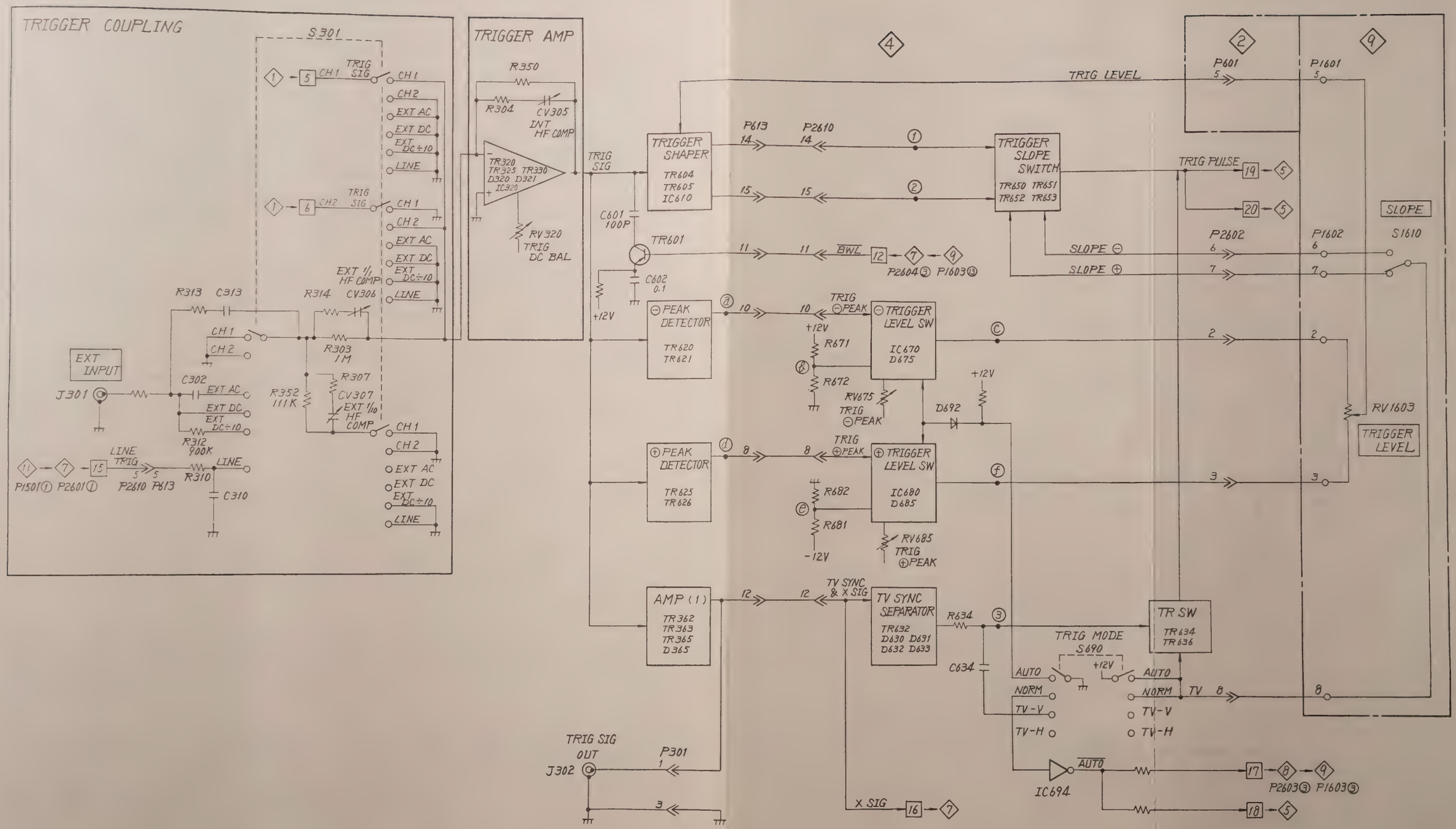

TRIGGER COUPLING
S301
TRIG SIG
CH1
CH2
EXT AC
EXT DC
EXT DC÷10
LINE
EXT 1/10 HF COMP
R313 C313
R314 CV306
R303 1M
EXT INPUT
J301
C302
R352 111K
R307
CV307
R312 900K
R310
C310
LINE TRIG
P1501① P2601①
P2610 P613
TRIGGER AMP
R350
R304
CV305 INT HF COMP
TR320 TR325 TR330 D320 D321 IC320
RV320 TRIG DC BAL
TRIG SIG
C601 100P
TR601
C602 0.1
+12V
TRIGGER SHAPER
TR604 TR605 IC610
P613 14
P2610 14
15
PEAK DETECTOR
TR620 TR621
TRIG ⊖PEAK
TRIGGER LEVEL SW
IC670 D675
R671
R672
RV675 TRIG ⊖PEAK
D692
⊕PEAK DETECTOR
TR625 TR626
TRIG ⊕PEAK
⊕TRIGGER LEVEL SW
IC680 D685
R682
R681
-12V
RV685 TRIG ⊕PEAK
AMP (1)
TR362 TR363 TR365 D365
TV SYNC & X SIG
TV SYNC SEPARATOR
TR632 D630 D631 D632 D633
R634
C634
TRIG MODE S690
AUTO
NORM
TV-V
TV-H
TR SW
TR634 TR636
TV
IC694
TRIG SIG OUT
J302
P301
X SIG
TRIG LEVEL
TRIGGER SLOPE SWITCH
TR650 TR651 TR652 TR653
BWL
P2604⑤ P1603⑬
SLOPE ⊖
SLOPE ⊕
TRIG PULSE
P601
P1601
P2602
P1602
SLOPE
S1610
RV1603
TRIGGER LEVEL
P2603③ P1603③

Fig. 5-2

5.4 SWEEP CYCLE (◇5◇)

This circuit is provided to perform a cycle sweep, which is one of the major features of this oscilloscope. Since the sweep circuit and the hold-off circuit are operated independently, the cycle time (= sweep time + hold-off time) can be fixed. In other words, when the TRIGGER LOCK control on the front panel is pressed (the cycle lock on mode), the cycle time is fixed by the microcomputer and a stable trigger is obtained regardless of the sweep time (TIME/DIV range).

The main operation of this circuit is described below, referring to the simplified circuit diagram shown in Fig. 5-3.

(1) The sweep state (the trigger sweep or the free-running sweep) is determined by the state of the signal on pin 2 of IC661 (3/4). In the trigger sweep mode, pin 3 goes "H" and D665 turns to off because pin 2 is "L".

(2) When the hold-off voltage $\overline{\text{HOLD OFF}}$ goes "L", DELAY GATE (CYCLE GATE) IC660 (2/2) is reset, and $\overline{\text{Q2}}$ goes "H".

(3) When Q2 goes "H", D664 is off, and the DLY GATE signal goes "H".

(4) Thus, switching transistor TR2010 turns on, and the gate voltage of BUFFER TR2060 is set to the starting level of the DELAY RAMP.

(5) When the hold-off period finishes, the $\overline{\text{HOLD OFF}}$ changes from "L" to "H". In other words, IC660 (2/2) is released from the reset state and is in the wait state.

(6) When the TRIG PULSE is fed to T2 from [20], $\overline{\text{Q2}}$ changes from "H" to "L" during the rising edge of the TRIG PULSE.

(7) When $\overline{Q2}$ goes "L", D664 is on, and the $\overline{\text{DLY GATE}}$ signal is "L".

(8) Then TR2010 turns to off, delay capacitor C_{DLY} (C2012 // C2013) starts to be charged, and the gate voltage of BUFFER TR2060 starts to increase.
The charging current is supplied from the delay current source, and the current value is changeable by the TIME/DIV setting. When the TIME/DIV setting value is set, the constant charging current flows in C_{DLY}. As a result, the gate voltage of TR2060 increases linearly.
The delay current signal from [26] is an analog voltage to determine the delay current. The voltage is held by C2017, and is applied to pin 10 of IC2040 (3/4) through the filter consisting of R2015 and C2015.

(9) Portion of the output of BUFFER TR2060 is sent to COMPARATOR IC2050 (2/2) as a DELAY RAMP signal. In this comparator, the output levels of ACTIVE FILTER IC2040 (1/4) and the DELAY RAMP signal are compared. When the DELAY RAMP signal level exceeds the output level of the ACTIVE FILTER, the output of the COMPARATOR goes "L". Accordingly, the $\overline{\text{DLY TRIG}}$ signal goes "L". In the B sweep mode, the sweep starts after the predetermined delay time from the trigger point. Either the DLY REF signal from [37] or the DLY PRESET signal from [38] is fed to the ACTIVE FILTER. The DLY REF signal is fed to the ACTIVE FILTER in the normal delay mode, and the DLY PRESET signal is fed to the ACTIVE FILTER in the automatic calibration mode. The DLY REF signal is the voltage corresponding to the delay time set by the controls on the front panel.

The other portion of the output of BUFFER TR2060 is fed to COMPARATOR TR2063, and used to detect the maximum voltage of the DELAY RAMP signal. Normally, the output of COMPARATOR TR2063 is "H", the output ($\overline{Q}$) of RS LATCH IC2052 3/3 is "L", and the output ($\overline{\text{HOLD OFF}}$) of IC2052 2/3 is "H". When the

DELAY RAMP signal reaches the maximum value, the output of COMPARATOR TR2063 goes "L" (because TR2063 turns to on.). Therefore, the RS LATCH is reset, $\overline{Q}$ goes "H", and the $\overline{\text{HOLD OFF}}$ signal goes "L".

(10) As a result, DELAY GATE (CYCLE GATE) IC660 2/2 is reset, $\overline{Q2}$ signal goes "H". This state is the same as that of step (3). Then D664 turns to off, TR2010 turns to on, and the gate voltage of BUFFER TR2060 is set to the start level of the DELAY RAMP. Moreover, the output of COMPARATOR TR2063 returns to "H".

(11) Next, the circuit related to the HOLD OFF RAMP signal is described below.
When the $\overline{\text{DLY GATE}}$ is "L", TR2040 is on, and the collector voltage of TR2045 remains at the start level of the HOLD OFF RAMP signal.

(12) The integration of the DELAY RAMP signal finishes before the output of TR2063 described in step (10) goes "H", and TR2040 changes from on to off. At this time, the integration of the HOLD OFF RAMP starts.

(13) TR2040 turns to off, HOLD OFF CAPACITOR C_{HO} (C2042 // C2043) begins to be charged, and the collector voltage of TR2045 begins to increase. The charging current is supplied from the HOLD OFF CURRENT SOURCE. This current value is changeable by the TIME/DIV setting value. When the TIME/DIV setting value is set, the constant charging current begins to flow, and the collector voltage of TR2045 increases linearly.

(14) The collector voltage of TR2045 and the VAR H/O voltage fed via VOLTAGE FOLLOWER IC2040 (4/4) are compared by COMPARATOR IC2050 (1/2) in the next stage. The VAR H/O voltage corresponds to the setting value of the VARIABLES and HOLD OFF controls on the front panel.

(15) When the HOLD OFF RAMP voltage (the collector voltage of TR2045) exceeds the VAR H/O voltage, the output of COMPARATOR IC2050 (1/2) goes "L".

(16) Thus, RS LATCH IC2052 (3/3) is in the set state, and $\overline{Q}$ goes "L".

(17) As a result, $\overline{\text{HOLD OFF}}$ (the output of IC2052 2/3) goes "H", and the period of the holdoff finishes.
In case of the single sweep, the collector voltage of TR2045 is clamped on the clamp voltage (the voltage obtained by dividing 5 V by R2080 and R2081) by clamp circuit TR2080 so as not to operate the hold-off circuit.

Circuits related to the sweep

(i) A SWEEP

(a) Since the $\overline{A}$ signal from 25 is "L", the output from pin 11 of IC661 (1/4) is "H", and TR661 is on. Therefore, the $\overline{\text{DLY TRIG}}$ signal cannot pass the differentiation circuit consisting of C669 and R669A in the next stage and S1 of SWP GATE IC660 (1/2) remains "H". This is because only the rapid changing component of the signal can pass the differentiation circuit. In other words, in the A SWEEP the route of S2 is not used.

(b) Moreover, since the output from pin 11 of IC661 (1/4) is "H", D660 turns to off, and pin 9 of IC659 goes "H". In case of the trigger sweep, pin 3 of IC661 (3/4) is also "H", and D661 is off.

(c) When $\overline{Q2}$ changes from "H" to "L" under the above state, the output from pin 8 of IC659 changes from "L" to "H". That is, when T1 of SWEEP GATE IC660 (1/2) changes from "L" to "H", Q1 changes from "L" to "H", and the $\overline{\text{SWP GATE}}$ signal from $\overline{Q1}$ changes from "H" to "L". Thus, the sweep begins.

(ii) B SWEEP

(a) Since the $\overline{A}$ signal from [25] is "H", the output from pin 11 of IC661 (1/4) goes "L".

(b) Therefore, D660 is on, and pin 9 of IC659 goes "L". The output of pin 8 remains "H" independent of the state of pin 10 of IC659. In case of the B SWEEP the route of S1 is not used.

(c) On the other hand, the output from pin 11 of IC661 (1/4) is "L", and TR661 becomes off.

(d) Therefore, when the $\overline{\text{DLY TRIG}}$ signal changes from "H" to "L", the change is applied to terminal S of SWEEP GATE IC660 (1/2) through the differentiation circuit.

(e) As a result, IC660 (1/2) turns to the set state, Q1 changes from "L" to "H", and $\overline{Q1}$ changes from "H" to "L". Thus, the B SWEEP begins.

The DLY ADJUST signal from [21] is the signal for the automatic calibration of the delay time. Though the delay time is controlled by a screwdriver adjustment in conventional oscilloscopes, in this oscilloscope, the delay time is calibrated automatically by the built-in microcomputer when the power switch is turned on.

AUTO GATE circuit

(A) NORM mode (trigger sweep)

The $\overline{\text{AUTO}}$ signal from [18] is "H", and TR660 is on. Pin 2 of IC661 (3/4) goes "L", and pin 3 goes "H". Therefore, D665 turns to off, the AUTO GATE circuit does not function in the NORM mode.

(B) Auto mode

The $\overline{\text{AUTO}}$ signal from [18] goes "L". There are two kinds of sweep in the AUTO mode: the trigger sweep and the free-running sweep.

(a) Trigger sweep

① When the TRIG PULSE is supplied to T2, Q2 changes from "L" to "H" during the rising edge of the pulse.

② When Q2 goes "H", TR660 turns to on, C664 is shorted, and pin 2 of IC661 (3/4) remains "L".

③ When the DELAY RAMP signal voltage reaches the maximum, the $\overline{\text{HOLD OFF}}$ signal is "L", and the hold-off period begins.

④ When the $\overline{\text{HOLD OFF}}$ signal goes "L", Q2 changes from "H" to "L", and TR660 turns to off. On the other hand, D663 turns to on, the anode side of D662 goes "L", and D662 becomes off. Therefore, C664 is not charged. Pin 2 of IC661 (3/4) remains "L".

⑤ When the hold-off period finishes, the $\overline{\text{HOLD OFF}}$ changes from "L" to "H", D663 turns to off, D662 turns to on, and C664 begins to be charged.

⑥ As a result, the voltage on pin 2 of IC661 (3/4) increases gradually. However, the trigger pulse is repeatedly fed to pin 2 of IC661 (3/4) before the voltage reaches the threshold level, and the "L" level, namely the trigger sweep state, is maintained.

(b) Free-running sweep

If TRIG PULSE is not fed when the voltage on pin 2 of IC661 (3/4) reaches the threshold level in the above description (a) ⑥ (even when pin 2 changes from "L" to "H"), the free-running sweep begins.

In other words, when pin 2 goes "H", pin 3 goes "L", and D661 and D665 turn to on. When D661 is on, pin 9 of IC659 goes "L", pin 8 goes "H", and the sweep begins. When D665 turns to on, the $\overline{\text{DLY GATE}}$ signal goes "L", and the DELAY RAMP signal is generated.

COUNTER circuit IC2170 (1/2, 2/2)

When the TRIG PULSE is fed to T3, the divided-by-two pulse is fed out from Q3, and the divided-by-four pulse is fed out from Q4. These pulse are sent to the microcomputer and used to count the frequency of the trigger pulse. The waveform of 1.6 to 4 cycles is displayed on the CRT in the AUTO range mode.

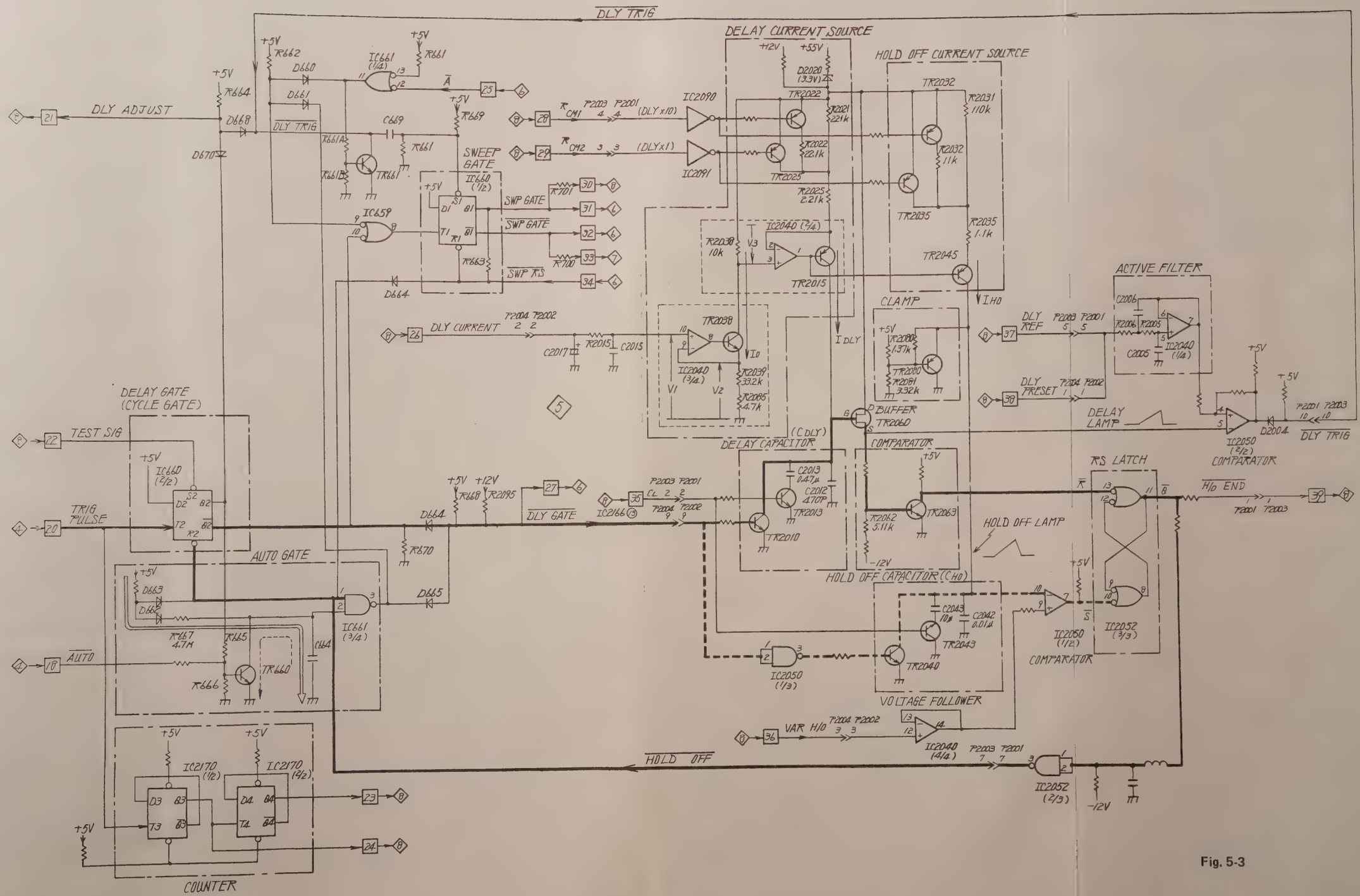

DLY TRIG
DELAY CURRENT SOURCE
HOLD OFF CURRENT SOURCE
DLY ADJUST
SWEEP GATE
SWP GATE
SWP RS
DLY CURRENT
IC2090
IC2091
TR2022
TR2032
TR2025
TR2035
TR2045
TR2015
IC2040 (3/4)
CLAMP
BUFFER TR2060
ACTIVE FILTER
DLY REF
DLY PRESET
DELAY LAMP
IC2050 (2/2) COMPARATOR
DELAY GATE (CYCLE GATE)
TEST SIG
TRIG PULSE
AUTO
AUTO GATE
DLY GATE
DELAY CAPACITOR (CDLY)
COMPARATOR
RS LATCH
H/O END
HOLD OFF LAMP
HOLD OFF CAPACITOR (CHO)
IC2050 (1/2) COMPARATOR
IC2052 (3/3)
IC2050 (1/3)
VOLTAGE FOLLOWER
VAR H/O
IC2040 (4/4)
IC2052 (2/3)
HOLD OFF
IC2170 (1/2)
IC2170 (2/2)
COUNTER

Fig. 5-3

5.5 SWEEP (◇6◇ 1/2)

The detailed block diagram of this circuit is shown in Fig. 5-4. When the sweep begins, the $\overline{\text{SWP GATE}}$ signal entered at [32] changes from "H" to "L", and the SWP GATE signal entered at [31] changes from "L" to "H". Accordingly, diodes D710, D711, and D712 turn to off. The TIMING CAPACITOR (C_T) is provided between the input and the output of the INVERTING AMP consisting of TR710, TR712, and TR714 to form a miller integrator. C_T is determined by C710 // C711 or C710 // C711 // C715.

The integration current I_T is determined by the input voltage of IC730 and the timing resistors (R_T), which are determined by the TIME/DIV setting. The value of C_T is determined by C710 // C711 or C710 // C711 // C715. The value of R_T is determined by R740, R740 // R741, R740 // R743 or R740 // R745. When diodes D710, D711, and D712 turn to off, the integration current I_T begins to flow to the TIMING CAPACITOR C_T, and the voltage of C_T begins to increase linearly corresponding to I_T.

The output voltage of the INVERTING AMP is fed out from [39] as the SWP OUT signal via ANALOG SW2 IC717. Part of the output voltage of the INVERTING AMP is fed to voltage comparator TR723 via ANALOG SW2 IC717, and the maximum voltage of the SWP OUT signal is determined by comparing the output voltage of the INVERTING AMP with the base voltage of TR723. When TR723 detects the maximum voltage, its collector voltage turns to "L", and the $\overline{\text{SWP RS}}$ signals fed from [34] and [49] also turn to "L". The $\overline{\text{SWP RS}}$ signal is applied to FF IC660(1/2) (13) shown in ◇5◇, and turns the output of the $\overline{\text{SWP GATE}}$ to "H". When the $\overline{\text{SWP GATE}}$ goes "H" and the SWP GATE goes "L", diodes D710, D711, and D712 turn to on. The input and the output of the INVERTING AMP are thus shorted, and the TIMING CAPACITOR C_T discharges rapidly.

As a result, the output voltage of the INVERTING AMP falls down to the voltage at the beginning of the sweep, voltage comparator TR723 turns to off, and the collector voltage of TR723 is reset to "H".

The CS A DATA signal entered at [44] is a DC voltage (analog value) corresponding to the A sweep, and the CS B DATA signal entered at [45] is a DC voltage (analog value) corresponding to the B sweep. The CS A and CS B DATA signals are changed by the TIME/DIV setting, and accordingly, the voltage V_T of the V_T/I_O CONVERTER is changed. The TIME/DIV setting is changed to 1:2:5 by changing the voltage V_T. The figures of the TIME/DIV setting value are determined by changing the value of the timing resistor R_T to 1:10:100:1000.

The Q_E output ($\overline{A}$) of SHIFT REGISTER IC2165 controls ANALOG SW1 IC717 via IC738. The CS A DATA signal and the CS B DATA signal are supplied to the V_T/I_O CONVERTER in the A sweep mode and in the B sweep mode, respectively. V_T is a voltage corresponding to the CS A DATA signal or the CS B DATA signal, and the current I_O corresponding to V_T flows across R732. The resulting voltage V_O is fed to the V_O/I_T CONVERTER and the output current I_T corresponding to V_O flows to the TIMING RESISTOR R_T. The V_T/I_T CONVERTER consists of the V_T/I_O CONVERTER and the V_O/I_T CONVERTER, and the current I_T corresponding to the CS A DATA signal or the CS B DATA signal is obtained. Since I_T is fed to the miller integrator, the SWP OUT signal corresponding to the CS A DATA signal or the CS B DATA signal is obtained.

R_{T1}, R_{T2}, and R_{T3} fed from Q_B, Q_C, and Q_D of SHIFT REGISTER IC2165 are control signals to switch the timing resistor R_T. R_{T1}, R_{T2}, and R_{T3} are supplied to switching transistors TR745, TR743 and TR741 via LEVEL SHIFT TR750, TR751, and TR752, respectively, and the value of R_T is determined. Only the A sweep is provided with the SWP VAR function, and the voltage

value of the CS A DATA signal is changed continuously by the microcomputer.

IC2165 is an 8-bit shift register having serial inputs and parallel outputs. The 8-bit shift register and the latch are packed onto a single chip. The S DATA signal fed to the SER is shifted to the register bit by bit during every rising edge of the shift register clock S CLK2 signal fed to the SRCK. The 8-bit data in the register is transferred simultaneously to the latch circuit during the rising edge of the register clock pulse entered at RCK and the latch data is updated. (While the S DATA signal is being acquired, Q_A to Q_H are being held in the previous state and the data on Q_A to Q_H is updated during the rising edge of RCK.) The shift register and the latch circuit (storage register) have the individual clear signals (shift register clear $\overline{\text{SRCLR}}$ signal and register clear $\overline{\text{RCLR}}$ signal). The clear signals are synchronized with the clock pulse when they are H.

The S DATA signal from [42] switches the TIME/DIV setting and the vertical channel. The clock pulse S CLK2 is fed from [43] only when the content of the S DATA is changed.
The S CLK2 pulse is generated by PC2 and PC6 pulses fed out from IC3101 of the microcomputer shown in ◇8◇ . PC2 is a clock pulse being fed out continuously. PC6 is a clock enable signal and controls the clock pulse P2. The passage of the clock pulse through the gate circuit (IC2107 of ◇8◇) is controlled by the PC6 signal. The colck pulse passing the gate circuit (IC2107 shown in ◇8◇) is an S CLK2 pulse.
The route of a register clock pulse fed to the RCK terminal (pin 12) of SHIFT REGISTER IC2165 is different in the normal sweep mode and in the non-sweep mode (mainly in the X-Y mode).

(1) When the sweep is performed

When the $\overline{\text{DLY GATE}}$ signal from [27] changes from L to H, the register clock pulse fed to the RCK terminal changes from L to H, and the 8-bit data in the register is transferred simultaneously to the latch circuit during the rising edge of

the register clock pulse. Strictly speaking, since the $\overline{\text{DLY GATE}}$ signal passes through the differentiation circuit consisting of C2167 and R2167, and gate circuit IC2162 (2/4), the register clock pulse changes from L to H after the $\overline{\text{DLY GATE}}$ signal has changed from L to H. This is because the latch data is updated when the hold-off period begins completely.

The PC6 signal from [40] changes the state of pin 5 of IC2162 (2/4), and controls the transmission of the change of the $\overline{\text{DLY GATE}}$ signal to the RCK terminal. When the updating of the latch data is prohibited, namely when a new S DATA is being sent, PC6 from [40] is H. Therefore, pin 5 of IC2164 (2/4) goes L, and the change of the $\overline{\text{DLY GATE}}$ signal cannot pass throuth the gate circuit IC2162 (2/4).

When all the data of 8-bit S DATA is shifted to the shift register, and the sweep is finished, data is transferred from the shift register to the latch circuit.

(2) When the sweep is not performed (mainly in the X-Y mode)

The microcomputer controls the transmission of the latch data directly. When the data is updated, a negative pulse is fed from [41] .

The output of Q_H is sent to microcomputer IC3101 in ◇8◇ via [47] , and informs the microcomputer of the latch state. The S DATA fed to $Q_{H'}$ is fed to the front panel board via [48] . The LED's (D1601, D1602, and D1605 to D1611 in ◇9◇) on the panel are blinked by this output of $Q_{H'}$.

TR708 and TR709 are switching transistors. When the TIME/DIV switch is set to 0.5 ms or 0.2 ms, the Q_A and Q_B outputs of SHIFT REGISTER IC2165 are L and H, respectively, and TR708 and TR709 become on. Thus, R703 is shorted, and the current flowing across R703A increases. As a result, the reset duration of the sweep waveform can be made short, and a brighter waveform can be observed.

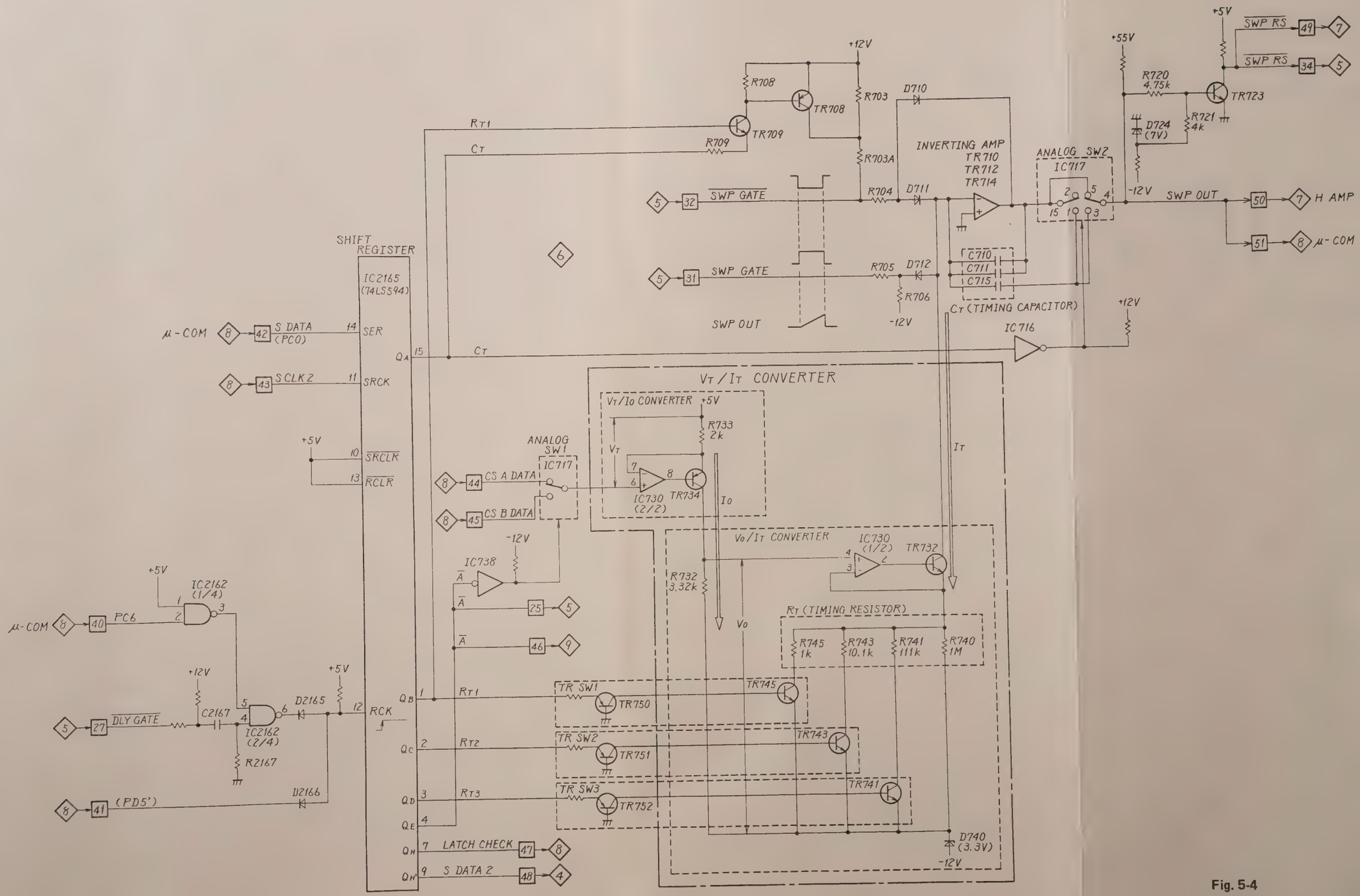

SHIFT REGISTER
IC2165 (74LS594)
μ-COM
S DATA (PC0)
S CLK 2
SRCK
SRCLR
RCLR
RCK
QA
QB
QC
QD
QE
QH
QH'
+5V
+12V
-12V
Rt1
Ct
R708
TR708
TR709
R709
R703
R703A
D710
INVERTING AMP
TR710
TR712
TR714
R704
D711
SWP GATE
R705
D712
R706
SWP OUT
C710
C711
C715
Ct (TIMING CAPACITOR)
IC716
ANALOG SW2
IC717
R720 4.75k
TR723
R721 4k
D724 (7V)
SWP RS
H AMP
μ-COM
Vt / It CONVERTER
Vt/Io CONVERTER
R733 2k
Vt
Io
It
ANALOG SW1
IC717
CS A DATA
CS B DATA
IC730 (2/2)
TR734
IC738
Vo/It CONVERTER
IC730 (1/2)
TR732
R732 3.32k
Vo
Rt (TIMING RESISTOR)
R745 1k
R743 10.1k
R741 111k
R740 1M
TR SW1
TR SW2
TR SW3
TR750
TR751
TR752
TR745
TR743
TR741
D740 (3.3V)
LATCH CHECK
S DATA 2
IC2162 (1/4)
IC2162 (2/4)
PC6
DLY GATE
C2167
R2167
D2165
D2166
(PD5')
Rt1
Rt2
Rt3

Fig. 5-4

5.6 H AMP (◇7◇ 1/2)

Fig. 5-5 is the detailed block diagram of this circuit.
Normally the TR SW (1) circuit is not activated, and the SWP OUT signal from [50] is applied to the DIFF AMP(1) circuit via the AMP (1) circuit. In the X-Y mode, the $\overline{\text{X-Y}}$ signal from [52] goes L, so that TR811 turns off and TR812 turns on. Therefore, the TR SW (1) circuit is activated, and the X-SIG from [16] is applied to the DIFF AMP(1) circuit via the AMP(1) circuit. On the other hand, the H POS signal from [53] is set to the optimum DC voltage by H POS START RV807, and is applied to the DIFF AMP(1) circuit via the AMP(2) circuit.

The DIFF AMP(1) circuit is activated in the waveform display mode, and the DIFF AMP(2) circuit is activated in the dot display mode. When I_1 or I_2 flows, the DIFF AMP(1) circuit is activated. When I_3 flows, the DIFF AMP(2) circuit is activated. Either of I_1, I_2 or I_3 is always flowing. I_1 flows in the x1 mode, I_2 in the x10 mode, and I_3 in the dot display mode.
The selection of I_1, I_2 or I_3 is controlled by the $\overline{\text{X1}}$ signal from [54] and the DOT EN signal from [56].

The state of the $\overline{\text{X1}}$ signal is determined by DPDT switch (x10 MAG) S1605 in ◇9◇. One switching circuit (pins 4, 5, and 6) of S1605 controls the CURRENT SW(1) directly. The other switching circuit (pins 1, 2, and 3) informs the setting state (x1 or x10) of the microcomputer by changing the output voltage AN0 of D/A(2) RM1601. Pressing the [ALT] and [B] switches simultaneously results in the X-Y mode, and pin 4 of S1605 is grounded. Therefore, in the X-Y mode, even if the x10 MAG switch is set to the x10 side, the switch is forced to return to the x1 mode. The states of the [ALT] and [B] switches are informed of the microcomputer by the output voltage AN2 of D/A(1) RM1603.

D841 and D842 are switching diodes, and change the current flow in the DIFF AMP(1) circuit according to the x1 or x10 mode. Both diodes turn off in the x1 mode and on in the x10 mode.

In the waveform display mode, the output of the DIFF AMP(1) circuit is applied to the DIFF AMP(3) circuit.

In the dot display mode, the output of the DIFF AMP(2) circuit is applied to the DIFF AMP(3) circuit.

The DIFF AMP(3) circuit employs a common-base circuit, and the low impedance input and the high impedance output are realized. The output of the DIF AMP(3) circuit is sent to the CURRENT LIMITER circuit consisting of the common-base DIFF AMP circuit (TR851 and TR852) and the diodes (D873 and D874). This CURRENT LIMITER prevents the H OUTPUT AMP circuit from being driven up to a saturation field.

The output signal current of TR851 is amplified by emitter follower stage TR881 and common-emitter stage TR885. The amplified output is fed back to the input through R857, R855, C857, and C855. The feedback amount at high frequency is adjusted by CV859 to optimize the linearity at the 5 ns/div sweep.

TR871 is an active load of TR885. The AC component is applied to the base of TR871 through C883 so that the supply current increases when the output voltage changes to the positive at a high speed.

The operation of the circuits following TR852 is identical with the above operation except for signal polarities.

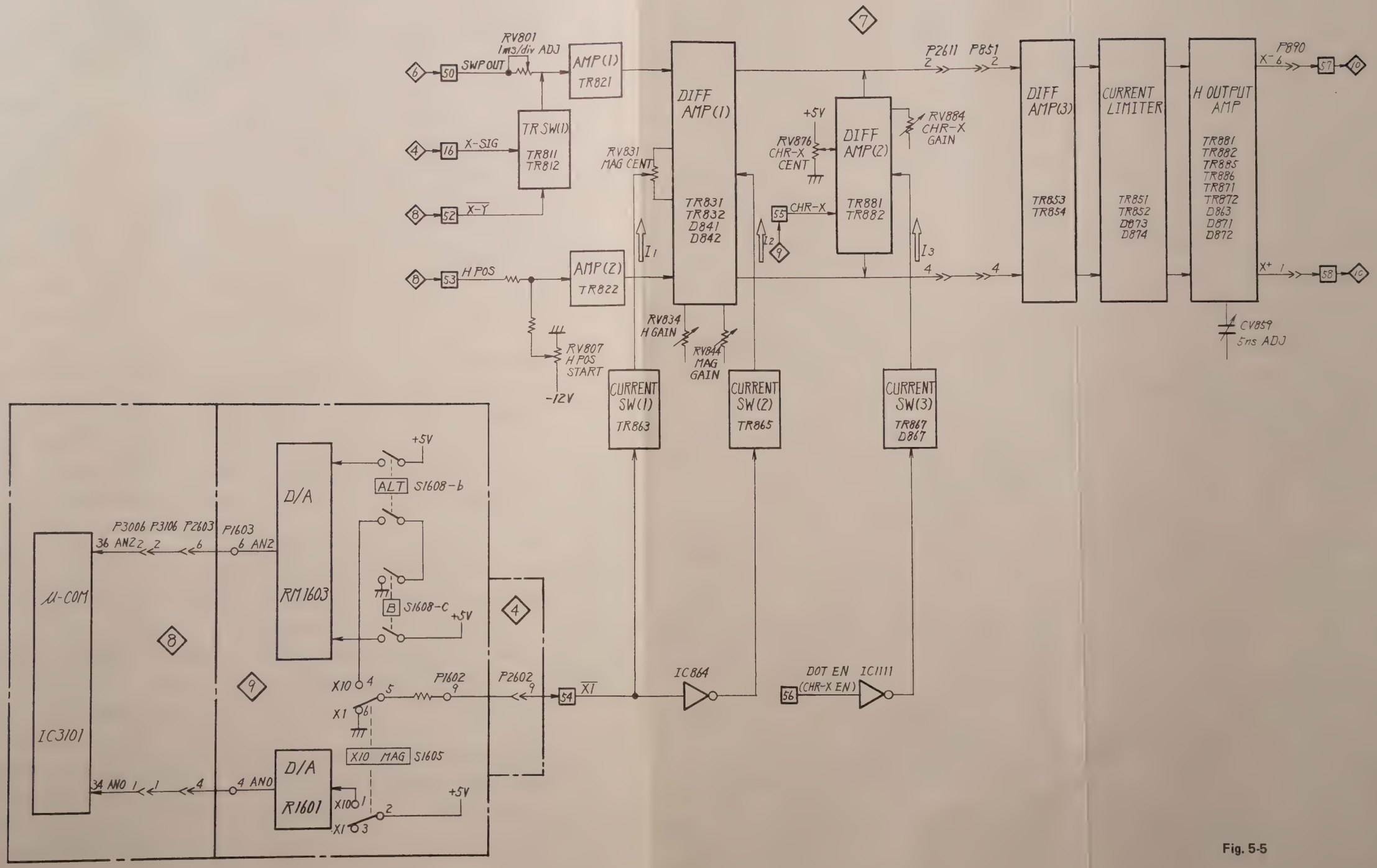

RV801
1ms/div ADJ
SWP OUT
AMP(1)
TR821
TR SW(1)
TR811
TR812
X-SIG
X-Y
AMP(2)
TR822
H POS
RV807
H POS
START
-12V
DIFF
AMP(1)
TR831
TR832
D841
D842
RV831
MAG CENT
RV834
H GAIN
RV844
MAG
GAIN
I1
I2
I3
+5V
RV876
CHR-X
CENT
DIFF
AMP(2)
TR881
TR882
CHR-X
RV884
CHR-X
GAIN
P2611
P851
DIFF
AMP(3)
TR853
TR854
CURRENT
LIMITER
TR851
TR852
D873
D874
H OUTPUT
AMP
TR881
TR882
TR885
TR886
TR871
TR872
D863
D871
D872
P890
X- 6
X+ 1
CV859
5ns ADJ
CURRENT
SW(1)
TR863
CURRENT
SW(2)
TR865
CURRENT
SW(3)
TR867
D867
μ-COM
IC3101
P3006 P3106 P2603
36 AN2 2 2 6
P1603
6 AN2
D/A
RM1603
+5V
ALT S1608-b
B S1608-C
+5V
X10 4
5
X1 6
P1602
9
P2602
9
XI
IC864
DOT EN IC1111
(CHR-X EN)
X10 MAG S1605
34 ANO 1 1 4
4 ANO
D/A
R1601
X10 1
2
X1 3
+5V

Fig. 5-5

5.7 UNBLANKING & Z-AXIS AMP (◇7◇ 2/2, ◇8◇ 1/2, ◇9◇ 3/4, ◇10◇)

Description on the UNBLANKING circuit and the Z-AXIS AMP circuit follows. Refer to Figs. 5-6 and 5-7.

UNBLANKING circuit

The UNBLANKING circuit consists of two functional blocks. One consists of IC1101 1/3, IC1101 3/3 and D1113 and controls a waveform display, and the other consists of IC1121 3/4 and D1114 and controls the readout character display. The intensity of the displayed waveform is controlled by the INTEN control and that of the readout characters by the READOUT INTEN control.
The waveform display and the readout display (the dot display) are performed by the time division.
Like the X-axis circuit and the Y-axis circuit, the UNBLANKING circuit in the Z-axis circuit is switched according to the time division. In other words, either of the two functional blocks (the $\overline{\text{UNBL}}$ and $\overline{\text{CHR Z}}$ signals) of the UNBLANKING circuit is selected by the DOT EN signal or the $\overline{\text{DOT EN}}$ signal according to the kind of the requested display, the waveform or the dots (characters of cursors).
To effect or not blanking of the waveform and the dots (characters or cursors) is controlled by the $\overline{\text{UNBL}}$ signal and the $\overline{\text{CHR Z}}$ signal, respectively. When the waveform is displayed, the $\overline{\text{UNBL}}$ signal is L, and the $\overline{\text{CHR Z}}$ signal is H.
Since the emitter voltage of TR901 is always zero volts, D1113 is on, and D1114 is off. When the dots (characters or cursors) are displayed, the $\overline{\text{UNBL}}$ signal is H, and the $\overline{\text{CHR Z}}$ is L. Therefore, D1113 is off, and D1114 is on.
When the sweep begins and the $\overline{\text{SWP GATE}}$ signal from [33] goes L or when the $\overline{\text{X-Y}}$ signal from [60] goes L in the X-Y mode, the $\overline{\text{UNBL}}$ signal fed out from pin 8 of IC1101 (3/3) goes L, resulting in the waveform display state.

When the CHR EN goes H to display characters, or the $\overline{\text{CUR EN}}$ signal L from [59] goes L to display cursors, the DOT EN signal is fed out from pin 11 of IC1121 (4/4), and resulting in the dot display state.
The waveform becomes the blanking state ($\overline{\text{UNBL}}$=H) in the following cases (1) to (4).

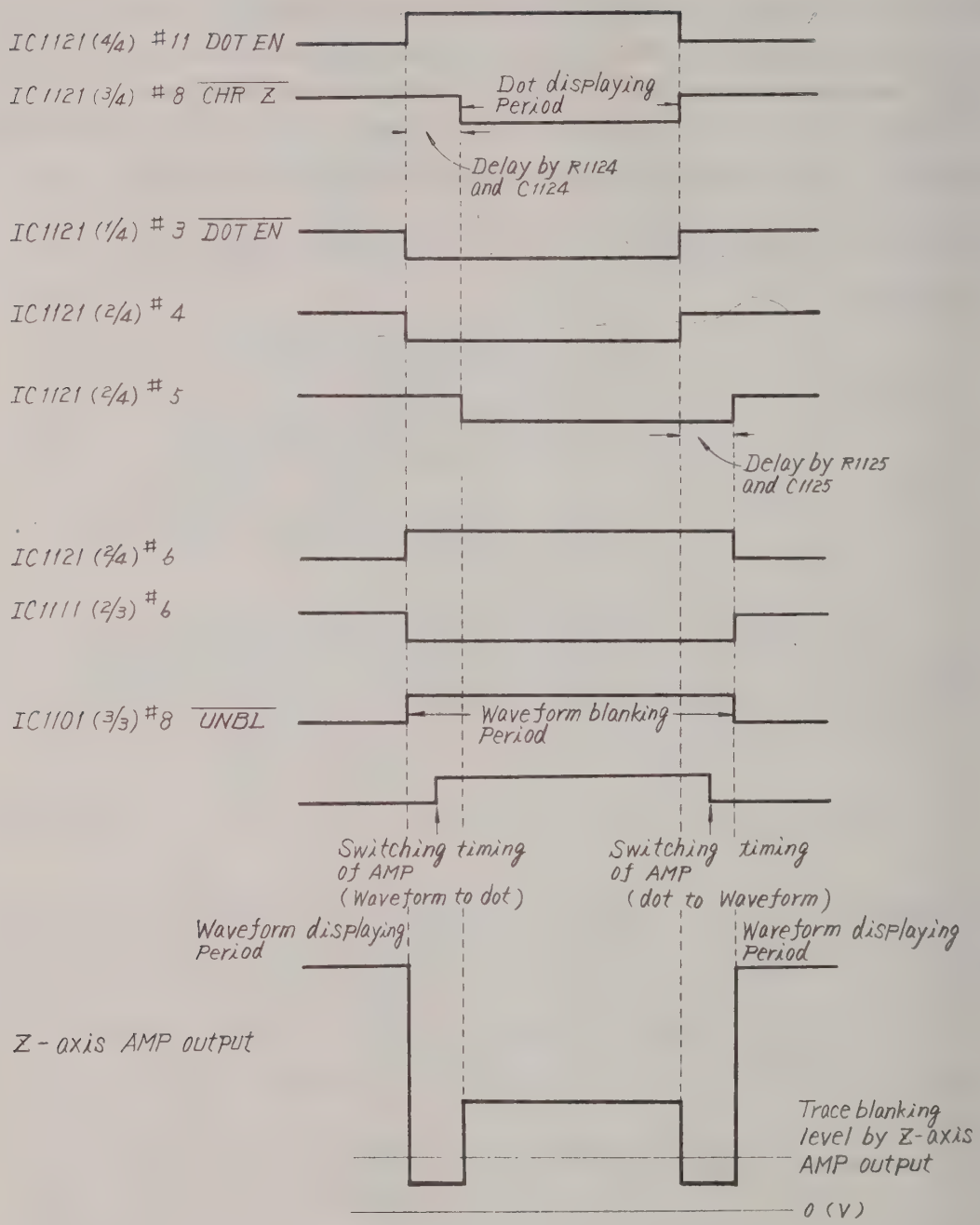
(1) When the sweep finishes, and the $\overline{\text{SWP RS}}$ signal from [49] goes L
(2) While the microcomputer are operating
In this case, D1101 or D1105 turns on.
(3) When the switching part needs to be blanked
In this case, D1102 turns on.
(4) Dot display
In this case, D1103 and D1104 turn on.

The H AMP is changed by the DOT EN signal (corresponding to the the CHR-X EN signal) fed out from [56], and the V AMP is changed by the $\overline{\text{DOT EN}}$ signal (corresponding to the $\overline{\text{CHR-Y EN}}$ signal) fed out from [61].

Z-AXIS AMP

This circuit consists of the current limiter (TR901 and D901) and the feedback AMP (TR906, TR910, and TR912). There are two input channels to this AMP. One is the waveform display channel of D1113, and the other is the dot display channel of D1114.
These channels are selected by the DOT EN signal fed out from pin 11 of IC1121 (4/4).
In either case, the current from TR901 emitter increases, the intensity of the CRT increases.
The change of the input current applied to TR901 emitter is not transmitted to the collector, but the change is not transmitted to TR906 by D901. Therefore, the output voltage of the Z.AXIS AMP is controlled so that it is not lower than approx. 5 V.

When the current of TR901 (from the emitter) increases, the current across D901 increases. Therefore, the base voltage of TR906 decreases. As a result, the base voltage of TR912 decreases, and the output voltage of the Z-AXIS AMP becomes more positive. This output is connected with the electrode G1 for the beam control of the CRT. So when the output voltage of the Z. AXIS AMP becomes further positive, the intensity increases accordingly.


IC1121 (4/4) #11 DOT EN
IC1121 (3/4) #8 CHR Z
Dot displaying Period
Delay by R1124 and C1124
IC1121 (1/4) #3 DOT EN
IC1121 (2/4) #4
IC1121 (2/4) #5
Delay by R1125 and C1125
IC1121 (2/4) #6
IC1111 (2/3) #6
IC1101 (3/3) #8 UNBL
Waveform blanking Period
Switching timing of AMP (Waveform to dot)
Switching timing of AMP (dot to Waveform)
Waveform displaying Period
Waveform displaying Period
Z-axis AMP output
Trace blanking level by Z-axis AMP output
0 (V)

Note 1 ; The above waveforms are synchronous each other.

Note 2 ; The unblanking waveform in each sweep and the above waveforms are asynchronous.

Fig. 5-6

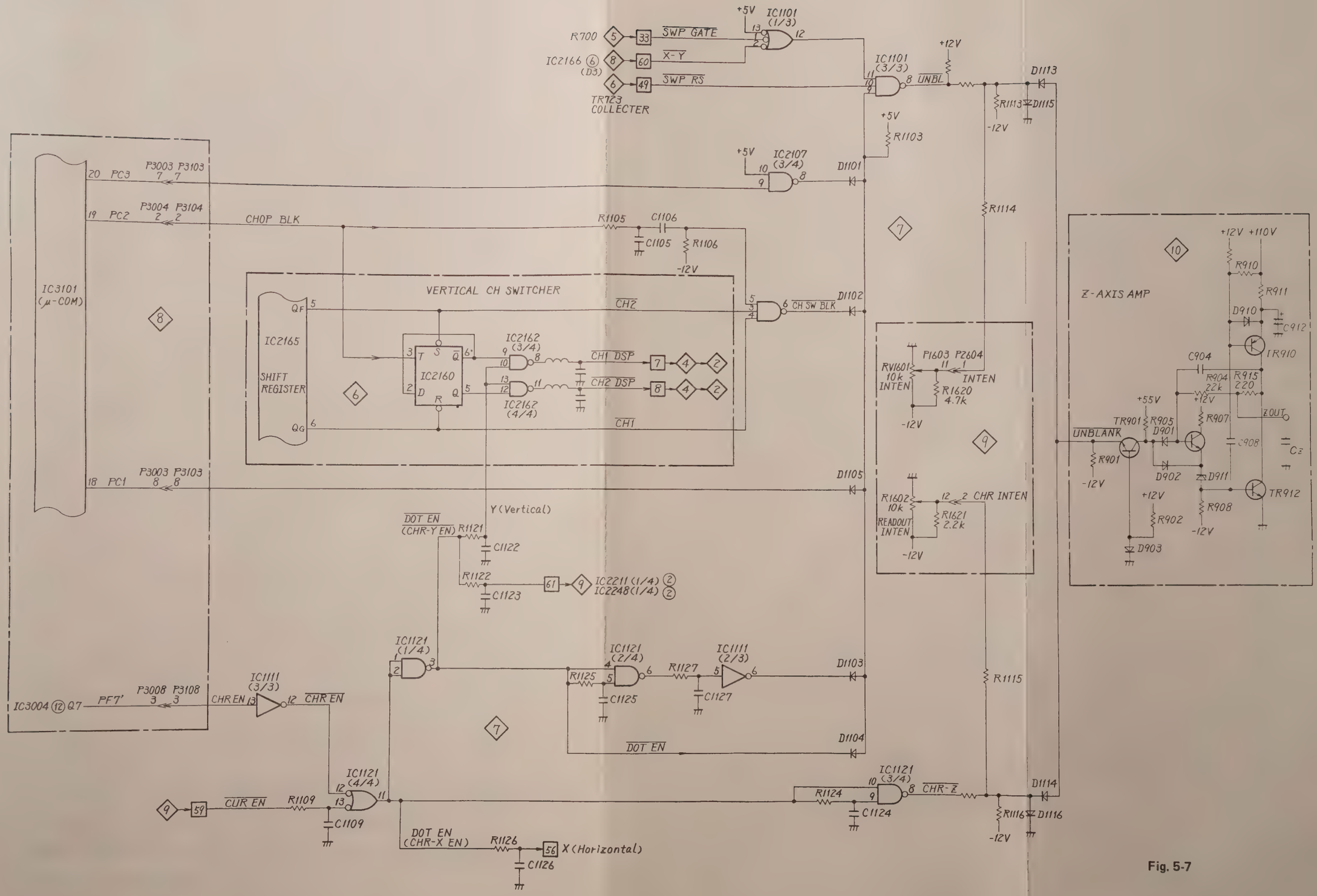

IC3101 (μ-COM)
20 PC3
P3003 P3103 7 7
19 PC2
P3004 P3104 2 2
CHOP BLK
18 PC1
P3003 P3103 8 8
IC3004 (12) Q7
PF7'
P3008 P3108 3 3
CHR EN
IC1111 (3/3)
VERTICAL CH SWITCHER
IC2165 SHIFT REGISTER
IC2160
IC2162 (3/4)
IC2162 (4/4)
CH1 DSP
CH2 DSP
CH2
CH1
CH SW BLK
R700
IC2166 (6) (D3)
TR723 COLLECTER
SWP GATE
X-Y
SWP RS
IC1101 (1/3)
IC1101 (3/3)
IC2107 (3/4)
+5V
+12V
UNBL
D1113
R1113
D1115
-12V
R1103
D1101
R1114
R1105
C1106
C1105
R1106
D1102
D1105
D1103
D1104
D1114
R1115
R1116
D1116
R1124
C1124
IC1121 (1/4)
IC1121 (2/4)
IC1121 (3/4)
IC1121 (4/4)
IC1111 (2/3)
R1125
C1125
R1127
C1127
R1109
C1109
CUR EN
DOT EN (CHR-X EN)
R1126
C1126
X (Horizontal)
DOT EN (CHR-Y EN)
R1121
C1122
R1122
C1123
Y (Vertical)
IC2211 (1/4) (2)
IC2248 (1/4) (2)
CHR-Z
P1603 P2604 11
RV1601 10k INTEN
R1620 4.7k
INTEN
R1602 10k READOUT INTEN
R1621 2.2k
CHR INTEN
Z-AXIS AMP
R910
R911
D910
C912
TR910
C904
R904 22k
R915 220
R907
ZOUT
TR901
R905
D901
UNBLANK
R901
D902
D911
TR912
R908
R902
D903
+55V
+110V
C908
Cz

Fig. 5-7

5.8 VERTICAL CH SWITCHER (◇6◇ 2/2)

Refer to Fig. 5-7 and Table 5-2.
The displayed channel is determined by the output signals $\overline{\text{CH1 DSP}}$ and $\overline{\text{CH2 DSP}}$. The state of these output signals are determined by the $\overline{\text{CH1}}$, the $\overline{\text{CH2}}$, and the $\overline{\text{DOT EN}}$ signals. The $\overline{\text{CH SW BLK}}$ signal for blanking the switching portion of the channel is generated from the $\overline{\text{CH1}}$ and the $\overline{\text{CH2}}$ signals. The clock pulse CHOP BLK of 500 kHz fed out from the microcomputer is constantly fed to terminal T of toggle flip-flop IC2160. The state of the $\overline{\text{CH1}}$ and the $\overline{\text{CH2}}$ signals fed out from Q_F and Q_G of SHIFT REGISTER IC2165 are determined by the V.MODE and the TIME/DIV switches.

Table 5-2 shows the relationship between "The Setting positions of the V MODE switch and the setting values of the TIME/DIV switch" and "The state of the $\overline{\text{CH1}}$, the $\overline{\text{CH2}}$, the $\overline{\text{CH1 DSP}}$, and the $\overline{\text{CH2 DSP}}$". Further, the supplemental explanation follows.

(1) When the V. MODE switch is set to CH1, the CH1 signal is displayed. Since the $\overline{\text{CH1}}$ signal is L, and the $\overline{\text{CH2}}$ signal is H, IC2160 is in the reset state, and H and L are fed out from $\overline{Q}$ and Q, respectively. (In this case, a clock pulse from T is not valid.) On the other hand, when characters are not displayed, the $\overline{\text{DOT EN}}$ signal fed to pins 10 and 13 of logic circuit IC2162 (3/4, 4/4) is H. Therefore, the $\overline{\text{CH1 DSP}}$ signal is L, the $\overline{\text{CH2 DSP}}$ is H, and the CH1 signal is displayed.

(2) When the V. MODE switch is set to CH2, the CH2 signal is displayed.
Since the $\overline{\text{CH1}}$ signal is H, and the $\overline{\text{CH2}}$ signal is L, IC 2160 is in the reset state.

(3) When the V. MODE switch is set to CHOP, the CH1 and the CH2 signals are displayed alternately at a 250 kHz cycle.
In this case, the $\overline{\text{CH1}}$ and the $\overline{\text{CH2}}$ signals are H, and IC2160 operates as a toggle flip-flop.

Therefore, the outputs of $\overline{Q}$ and Q are inverted during the rising edge of a 500 kHz clock pulse fed to T.

(4) When the V.MODE switch is set to DUAL,

a. When the TIME/DIV switch is set to 2 ms/DIV or slower, the circuit operation is the same as that of item (3).

b. When the TIME/DIV switch is set to 1 ms/DIV or faster, the polarities of the $\overline{CH1}$ and the $\overline{CH2}$ signals are opposite, and they are inverted every approx. 20 ms. Therefore, the CH1 or the CH2 signals are displayed alternately every approx. 20 ms.

Table 5-2

V MODE	TIME/DIV	$\overline{CH1}$	$\overline{CH2}$	Q	$\overline{Q}$	$\overline{CH1\ DSP}$	$\overline{CH2\ DSP}$	Displayed CH
CH1	----	L	H	H	L	L	H	CH1
CH2	----	H	L	L	H	H	L	CH2
CHOP	----	H	H	H↔L	L↔H	L↔H	H↔L	CH1↔CH2 (250 KHz)
DUAL	≧ 2 ms	H	H	H↔L	L↔H	L↔H	H↔L	CH1↔CH2 (250 KHz)
	≦ 1 ms	H↔L	L↔H	H↔L	L↔H	L↔H	H↔L	CH1↔CH2 (20 ms)

5.9 μ-COM, CHR GEN & FRONT PANEL (◈8◈ 2/2, ◈9◈ 4/4)

Outline

The description on the microcomputer, its peripheral circuits, the control circuit of information on characters and cursors, and the circuit which inputs information on the panel switch setting into the microcomputer follows. Refer to Fig. 5-8.

Most of information on the switches on the panel is acquired by the microcomputer, which controls the waveform display and the readout to obtain the optimum state.
Information on the panel switch setting is acquired as an analog signal from ports AN0 to AN7. The analog signal is converted into a digital signal by the A/D converter in the microcomputer. The processing programs are stored in ROM IC3001. The 10 bits digital data is converted into analog data. The converted analog data is output as a continuously variable signal among the control signals fed out from the microcomputer through ANALOG SWITCH IC2130. A digital control signal is fed out from port PC0 as an S-DATA (serial data), sent to the shift registers, and fed out as bit information.
The frequency of measured signals are counted by the counters outside the microcomputer, and fed to the microcomputer from port PC5 and used to determine the sweep time automatically.

While the change of the setting state is being fed out from the microcomputer, the waveform display is blanked so as not to appear the disturbance of the waveform. For this purpose, the control signal is sent to the Z-CONT circuit from the output port PC3. The character display data is fed out from IC3005 and IC3004, converted into analog data by RM2232 and RM2231, and fed out as analog voltages CHR-X and CHR-Y. The A/B ALT SEP BIAS voltage is fed out from the same terminal as that of CHR-Y. The switching of characters, cursor patterns, and A/B ALT SEP BIAS outputs is performed by ANALOG SWITCH IC2220.

The machine clock of this microcomputer is 12 MHz, and oscillated by ceramic oscillator X3101.
While the power is on, terminal $\overline{\text{RESET}}$ is maintained to be "L" by the RESET circuit until the voltage for the digital circuit power supply becomes stable.

Read of status information

Information concerning the setting state of switches on the panel is fed to ports AN0 to AN7 of the microcomputer as an analog signal.
When the variable control items related to the X axis and the VARIABLE SELECTION items for selecting cursors are selected, the microcomputer recongnizes the DC output voltage of endless variable resistor RV2400 (VARIABLES) as the control signal related to the selected item, and processes the output voltage. The microcomputer converts an analog signal into a digital signal by the built-in A/D converter, and performs various processes using the signal.
Terminals AV_{DD} and VA_{REF} are input terminals of the supply voltage and the reference voltage of the A/D converter, respectively.

Read of programs and transmission of data

Address information is sent to LATCH IC3003 from ports PD7 to PD0 of the microcomputer. At this time, terminal LE of IC3003 is "H" (latch enable), so that IC3003 latches this address information. Since terminal $\overline{\text{OE}}$ of IC3003 is always "L", information on the latched address is transferred to ROM IC3001 immediately. The high-order bits of address information is sent to ROM IC3001 from ports PF5 to PF0 of the microcomputer. At this time, $\overline{\text{CE}}$ (chip enable terminal) is "L" by the signals at PF7 and PF6.

When $\overline{RD}$ of the microcomputer goes "L", $\overline{OE}$ of ROM IC goes "L" by the operation of the LATCH CONTROL circuit. Therefore, the microcomputer reads the above designated address data (program) from ports PD7 to PD0 through the bus.
After the microcomputer performs the processing according to the read program, the processed data is output from each port.
Data of ports PD7 to PD0 is sent to F.F IC3005 and data of ports PF7 to PF0 is sent to F.F IC3004. The former is transferred to Q7 to Q0 of IC3005 and the latter to Q7 to Q0 of IC3004 during the rising edge of a clock pulse sent from the LATCH CONT.
At this time, $\overline{OE}$ of IC3001 goes "H", D7 to D0 become a high impedance state, and are not related to the data transfer.

Output of the analog control signal

The 8 bits output of PA7 to PA0 of the microcomputer and the 2 bits output of Q7 and Q6 of IC3005 are added. The resultant 10 bits data is converted into the analog voltage by D/A 1 (RM2120), and fed to ANALOG SWITCH IC2130. D/A 1 has a resolving power of 1000, and feeds out the analog voltage between 0 and 5 V. ANALOG SWITCH IC2220 is constantly switched in the fixed order by a 3 bits control signal from PB2 to PB0. The output voltage of the ANALOG SWITCH is maintained at the fixed voltage by a sample hold capacitor of each line. The INH signal in the "H" state is fed out from PB4 when the switch is changed to perform a "break before make" operation.

Transmission of serial data

A digital control signal is fed out from port PC0 as a serial data (S DATA) and fed out from SHIFT REGISTER's IC2166, IC2165 (◇6◇), IC1601 and IC1602 as a parallel information.

There are three kinds of S DATA: A, B and C. "A" is 16 bits and includes a 9 bits signal to light the LED on the front panel and a 1 bit control signal (Ci SEL A) to switch an input signal to input inport PC5 of the microcomputer. "B" is the 8 bits information data related to the switching of the TIME/DIV setting value of the waveform sweep and of the DISPLAY mode.
Shift registers IC2165, IC1601 and IC1602 are connected in series, and the 24 bits S DATA ("A" data + "B" data) is acquired from data input terminal SER of IC2165.
Then "A" data is allocated to IC1602 and B data to IC1602. Data of each shift register is acquired by the clock pulse SCLK2. TO change a digital control signal, a 24 bits S DATA including the bit to be changed is sent only once.
The 500 kHz pulse is fed out constantly from PC2. This pulse is controlled by the output signal PC6 and fed to GATE2 IC2107. When PC6 is "H", SCLK2 is fed out from GATE2 IC2107. PC6 is also used as a latch enable signal of IC2165. Refer to ◇6◇ for the latch operation.
"C" data includes information for determining the cycle period and of X-Y mode and 2 bits control signal (Ci SEL B, Ci SEL C) for the switching of IC2161. C data is fed to IC2166, and shifted by the shift clock pulse SCLK1. When any bit of the digital control signal is needed to change, an 8 bits S DATA including the changed bit is sent once. When all 8 bits data is shifted, the SCLK1 signal stops. The SCLK1 signal as well as the SCLK2 signal is a 500 kHz pulse, and its timing is controlled by the PC3 output.

The 8 bits B data is output simultaneously by the latch operation of IC2165 when the shift finishes, the waveform sweep finishes, and the hold-off period begins. Therefore, the switching of B data does not effect the display on the CRT.

After digital data related to the Y component of a character is converted to analog data by the D/A converter D/A 2, the DC voltage CUR-POS representing information about the vertical position of a character or a cursor position is added to an analog data, and input to analog switch IC2220. The CUR-POS is fed out from analog switch IC2130. Three bits data related to the X component of a character and 5 bits data related to the X position of each character are added, and the resultant 8 bits data is converted to the analog signal by the D/A 3.

Dots for cursors generated by the cursor dot generator are converted by the D/A 4, and fed to IC2220. Moreover, the 1 V DC voltage determining the center position of the horizontal axis of the A sweep waveform is applied to the terminal X2 of IC2220. The A/B ALT SEP BIAS voltage determining the center position of the horizontal axis of the B sweep waveform in the A/B ALT mode is applied to the terminal X3. The switching of IC2220 corresponding to these input signals is performed by the control signal $\overline{A}$, the CUR SEL signal, and the $\overline{\text{DOT EN}}$ signal. Table 5-3 shows the detail. The horizontal or vertical position of cursors on the CRT is determined by IC2220. The vertical or horizontal movement of cursors is determined by the CUR-POS signal.

Next, the description on the cursor pattern generator circuit follows. When the MEASURE switch on the front panel is selected, the CUR RESET signal fed from the microcomputer goes "L", the pin 10 of CURSOR DOT GENERATOR IC2248 goes "H", and the oscillation starts. The oscillated clock pulse is fed to $\overline{\text{CLK}}$ of COUNTER IC2212. The output from COUNTER is converted into an analog signal by the D/A 4. The converted analog signal is fed out as a cursor pattern signal. Since the pin 4 of D/A 4 (RM2211) is grounded, cursor patterns are dotted lines.
When counter output D6 goes "H", pin 10 of IC2248 goes "L", and the oscillation stops. At the same time, the COUNTER sends the CUR END signal in the "H" state to the microcomputer.

On the other hand, the switching of C data is performed by the shift of an 8 bits S DATA. Therefore, when the switching is performed during the sweep period, the normal display is not obtained. When the PC3 output is "H", the PC3 signal (SCLK1) is sent to the Z circuit to blank the display.

Acquirement of a control signal

The microcomputer acquires external information from PC5 through analog switch IC2161. When the power switch is turned to on, the microcomputer reads the DC voltage of terminals D7 to D5 of IC2161, discriminates the type of this oscilloscope, and selects the applicable program memorized in the ROM. Then, the microcomputer reads the DLY ADJUST and SWP GATE signals from D3 and D4, and executes the automatic calibration of the delay time. The automatic calibration is executed by converging the DLY RAMP signal by the TEST SIG fed from PC4, the analog output DLY PRESET, and the loop circuit consisting of the feedback signals DLY ADJ and SWP GATE.
Normally the switching control signals Ci SEL B and Ci SEL C of IC2161 are "L". When the Ci SEL A goes "L" or "H", D_0 or D_1 of the analog switch is connected, and the trigger pulse of the measured pulse is counted to determine the cycle time.
Moreover, the $\overline{\text{H/O END}}$ and the LATCH CHECK signals are fed to the microcomputer to transmit the external state.

Transmission of information on characters and cursor patterns

Data of character information is output from IC3004 and IC3005. In other words, 3 bits data related to the Y component of information representing a character is output on PF2' to PF0', 3 bits data related to the X component of information representing a character is output on PF6' to PF4', and 5 bits data related to the X position of each character is output on PD4' to PD0'.

The microcomputer receives the CUR END signal and sends the CUR RESET signal in the "H" state to reset the counter.
When the COUNTER is reset, D6 goes "L", but pin 5 of IC2211 is "H". Consequently pin 10 of IC2248 is "L", and the CURSOR DOT GENERATOR continues to stop the oscillation. When the CUR RESET goes "L" and the reset is released, the oscillation starts and the above operation is repeated.

Table 5-3

Kinds of DISPLAY		Control signal			Control signal of switch input		Connection of switches	Output signal of X terminal	Output signal of Y terminal
		$\overline{\text{DOT EN}}$	CUR SEL	$\overline{\text{A}}$	B	A			
Wave-form display	A sweep	H	*	L	H	L	$X_2 \rightarrow X$ $Y_2 \rightarrow Y$	1 V DC	No
	A/B ALT	H	*	H	H	H	$X_3 \rightarrow X$ $Y_3 \rightarrow Y$	A/B ALT SEP BIAS	No
Character display		L	L	*	L	L	$X_0 \rightarrow X$ $Y_0 \rightarrow Y$	Y component of a character (added to the CUR POS)	X component of a character
Horizontal cursor display		L	L	*	L	L	$X_0 \rightarrow X$ $Y_0 \rightarrow Y$	CUR POS	Cursor pattern
Vertical cursor display		L	H	*	L	H	$X_1 \rightarrow X$ $Y_1 \rightarrow Y$	Cursor pattern	CUR POS

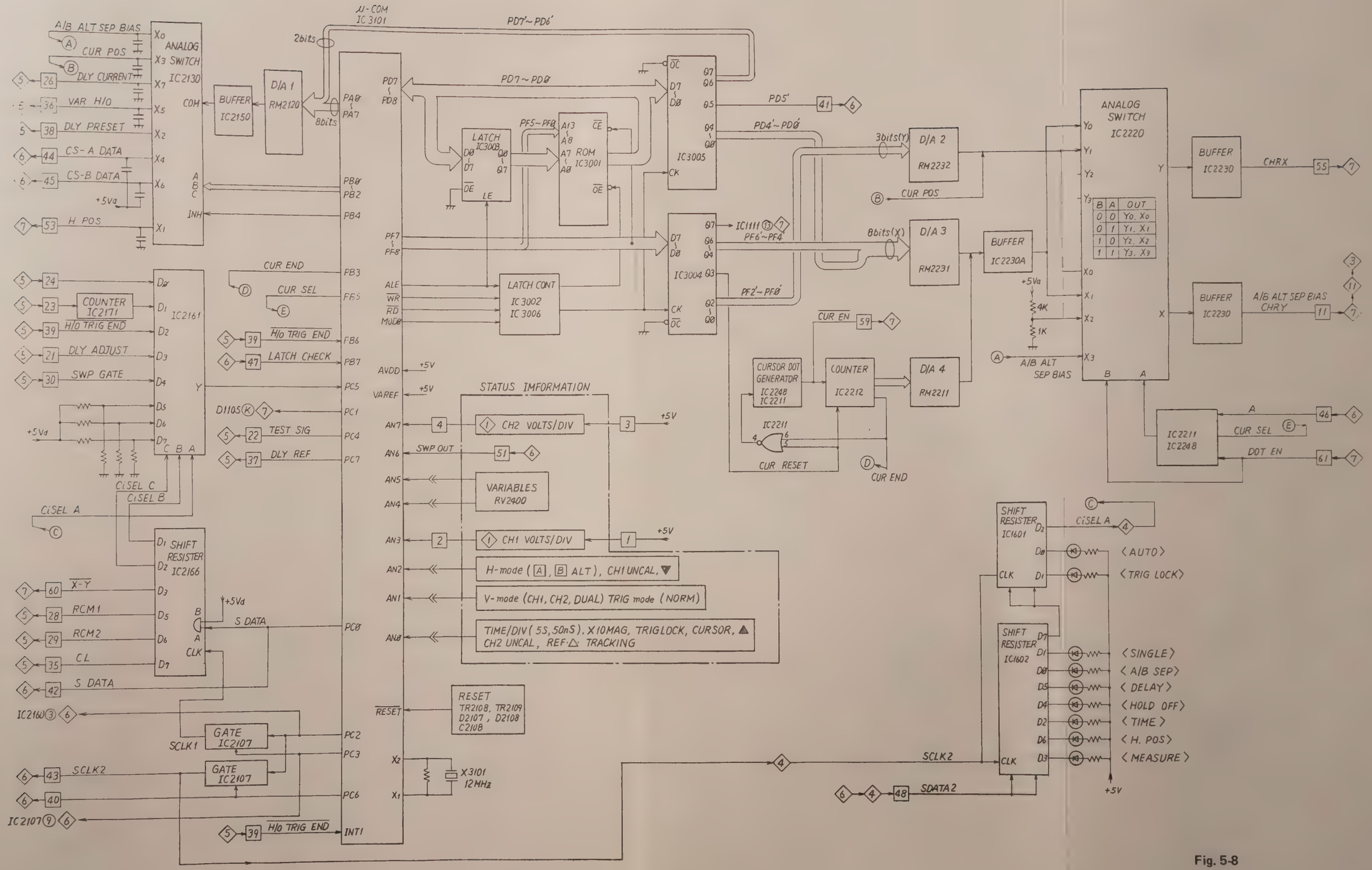

μ-COM IC3101
PD7'~PD6'
2bits
PD7~PD0
PD5'
PD4'~PD0'
PF5~PF0
PF6'~PF4'
PF2'~PF0'
ANALOG SWITCH IC2130
BUFFER IC2150
D/A 1 RM2120
8bits
A/B ALT SEP BIAS
CUR POS
DLY CURRENT
VAR H/O
DLY PRESET
CS-A DATA
CS-B DATA
+5Vd
H POS
LATCH IC3003
ROM IC3001
LATCH CONT IC3002 IC3006
IC3005
IC3004
IC1111
ALE
WR
RD
MUX0
AVDD +5V
VAREF +5V
COUNTER IC2171
IC2161
H/O TRIG END
DLY ADJUST
SWP GATE
CUR END
CUR SEL
LATCH CHECK
D1105
TEST SIG
DLY REF
C SEL C
C SEL B
C SEL A
SHIFT RESISTER IC2166
X-Y
RCM1
RCM2
CL
S DATA
SCLK1
SCLK2
GATE IC2107
IC2160
IC2107
STATUS IMFORMATION
CH2 VOLTS/DIV
CH1 VOLTS/DIV
SWP OUT
VARIABLES RV2400
H-mode (A , B ALT), CH1 UNCAL, ▼
V-mode (CH1, CH2, DUAL) TRIG mode (NORM)
TIME/DIV (5S, 50nS), X10MAG, TRIGLOCK, CURSOR, ▲
CH2 UNCAL, REF·△ TRACKING
RESET
TR2108, TR2109
D2107, D2108
C2108
X3101 12MHz
INT1
3bits(Y)
8bits(X)
D/A 2 RM2232
D/A 3 RM2231
D/A 4 RM2211
CURSOR DOT GENERATOR IC2248 IC2211
COUNTER IC2212
CUR EN
CUR RESET
CUR END
BUFFER IC2230A
+5Va
4K
1K
A/B ALT SEP BIAS
ANALOG SWITCH IC2220
B A OUT
0 0 Y0, X0
0 1 Y1, X1
1 0 Y2, X2
1 1 Y3, X3
BUFFER IC2230
BUFFER IC2230
CHRX
A/B ALT SEP BIAS CHRY
IC2211 IC2248
CUR SEL
DOT EN
SHIFT RESISTER IC1601
SHIFT RESISTER IC1602
〈AUTO〉
〈TRIG LOCK〉
〈SINGLE〉
〈A/B SEP〉
〈DELAY〉
〈HOLD OFF〉
〈TIME〉
〈H. POS〉
〈MEASURE〉
SCLK2
SDATA2
+5V

Fig. 5-8

5.10 HV, CRT (⟨10⟩)

The detailed block diagram of this circuit is shown in Fig. 5-9. This circuit consists of the following five blocks.

(1) High voltage generation circuit and the voltage regulator circuit
(VCO, PULSE AMP, SWITCH, FLYBACK TRANSFORMER & RECTIFIER, ERROR DETECTOR)

(2) Bias circuit for Grid No.1
(CHOPPER 1, DC RESTORER)

(3) Focus control circuit
(VOLTAGE DIVIDER, CHOPPER 2, DC RESTORER 2, focus and intensity control circuit)

(4) CRT

(5) Others
(TRACE ROTATION, ASTIG)

The circuit operations of the above blocks (1), (2), and (3) are described below. For details, refer to the schematic diagram HV, Z, CRT ⟨10⟩ .

(1) High voltage generation circuit and the voltage regulator circuit

(a) Voltage controlled oscillator (VCO)
The VCO supplies a positive pulse voltage from the collector of TR1002 by turning on and off TR1001 and TR1002 alternately. When the power switch is turned on, TR1001 becomes on, and C1004 starts to be charged through R1004. The charging voltage of C1004 rises the emitter voltage of TR1002 and then TR1002 becomes on. C1004 discharges immediately after TR1002 becomes on, the emitter voltage of TR1001 drops, and TR1001 becomes off. Then, C1004 is charged in the opposite direction through R1003, the emitter voltage of TR1001 rises, and TR1001 becomes on. These operations are repeated to continue generating the positive pulse.

The period of the pulse is determined by the on/off periods of TR1001 and TR1002. In other words, the period is determined by the time constants of R1003 and C1004, and R1004 and C1004 and the charging current. If the charging current is small, the pulse frequency becomes low, and the pulse width of the positive portion of the output pulse increases. Then, the energy in the primary coil of the FLYBACK TRANSFORMER (FBT) increases and the output voltage of the secondary coil increases.

(b) PULSE AMP

The positive pulse is amplified by PULSE AMP TR1010, and is supplied to the base of switching transistor TR1013 through pulse transformer T1013. The PULSE AMP amplifies the VCO output up to the level enough to drive the switching transistor and shapes the drive current waveform to minimize the cut-off loss of the switching transistor. The PULSE AMP also functions as a buffer to prevent the load variation at the output stage of the switching transistor from affecting the VCO.

(c) SWITCH

When the positive pulse is supplied to the base of switching transistor T1013, T1013 becomes on, the current which increases linearly flows into the primary coil of the FBT, and the energy is stored.

Even if the switching transistor becomes off, the current continues to flow in the same direction by the inductance inertia of the coil, and C1013 is charged.

The charging current decreases gradually, and the charging voltage becomes maximum when the charging current becomes zero. Then, a discharging current flows in the opposite direction through the coil. When the voltage on C1013 becomes zero, the discharging current becomes maximum.

D1013 becomes conductive by the counter electromotive force of the coil, and the current flows from the coil in the charging direction.

The current decreases gradually, and becomes zero again. Later, TR1013 becomes on by the next positive pulse, and the same circuit operation is repeated.

Thus, the alternate current flows into the coil and the voltage is generated at the secondary circuit.

(d) Voltage regulator circuit

This circuit detects a change in the cathode voltage of the CRT, and feeds back the change to the VCO to control the oscillation frequency so that the output voltage is regulated.

A small current flows from the base of TR1023 to the cathode line (-1650 V line in the schematic diagram) through R1035. The current is the sum of the base current of TR1023, the current through R1024, and the base current of TR1022.

For example, when the cathode voltage changes in the positive direction, the current flowing across R1035 decreases. Since the base current of TR1023 and the current across R1024 are constant, the base current of TR1022 decreases.

Then, the emitter current of TR1022 decreases, and the charging current of C1004 in the VCO also decreases.

Consequently, the oscillation frequency of the VCO becomes low as described in (a), and the cathode voltage of the CRT changes in the negative direction.

The secondary output voltage of the FBT is thus regulated by the feed-back loop.

(e) FBT

A half-wave rectified output of 15 kV (10 kV for the V-665 and the V-660) is supplied from the secondary side of the FBT, and is applied to the electrode P3 of the CRT. A half-wave rectified signal of -1650 V is supplied to the cathode.

The heater voltage is connected to the cathode line and is the same electric potential with the cathode voltage.

A -350 V pulse voltage is obtained to produce the G1 bias voltage and the focus bias voltage.

(2) Bias circuit for Grid No.1
(CHOPPER 1, DC RESTORER 1)

This circuit generates a voltage applied to G1 of the CRT. A pulse voltage is supplied from T1013 via C1040 and R1040. The positive peak voltage is limited to the CRT bias voltage (E_A) by D1040 and the negative peak voltage is limited to the output voltage (E_Z) of the Z-AXIS AMP.

Then, the chopped waveform having the envelope of the difference between E_A and E_Z appears at point (P) (See the block diagram).

The chopped waveform is supplied to D1043 via C1041, and the positive peak voltage is clamped to the -1650 V cathode voltage. The negative peak voltage is rectified by D1042 and D1043 to produce a negative DC voltage. As a result, the signal whose DC level is shifted to the voltage lower than the cathode voltage is supplied to G1. (The waveform of the signal is the same as that of the Z-AXIS AMP output.)

The high-frequency component of E_Z is directly supplied to G1 via C1043.

(3) Focus control circuit

This circuit produces a voltage applied to P1 (focus) of the CRT. The focus voltage is produced with the reference to E_{FR} (-1165 V) obtained by dividing the cathode voltage (-1650 V) and E_B at the FOCUS CENT control. Since an optimum focus voltage changes due to the variations in characteristics of the CRT, set E_B so that the optimum focus is obtained when the FOCUS and INTEN controls are set to their respective mid-positions. A pulse is supplied from T1013 via C1255 and R1260. The positive peak voltage is limited to E_B by D1282 and the negative peak voltage is limited to E_C set by the INTEN and FOCUS controls.
Then, a chopped waveform having the envelope of the difference between E_B and E_C appears at point (Q) (see the block diagram).

The chopped waveform is supplied to D1284, and the negative peak voltage is clamped to E_{FR} (-1165 V). The positive peak voltage is rectified by D1283 to generate a positive DC voltage. As a result, the voltage whose DC level is shifted to the level higher than E_{FR} is produced, and is applied to P1 as the focus voltage.
The relationship between the intensity of the CRT and the voltage for the optimum focus is not linear. Consequently, the change in E_C caused when the INTEN control is adjusted is approximated to the actual CRT characteristics using the polygonal line characteristics.

5.10 HV, CRT (⑩)

The detailed block diagram of this circuit is shown in Fig. 5-9. This circuit consists of the following five blocks.

(1) High voltage generation circuit and the voltage regulator circuit
(VCO, PULSE AMP, SWITCH, FLYBACK TRANSFORMER & RECTIFIER, ERROR DETECTOR)

(2) Bias circuit for Grid No.1
(CHOPPER 1, DC RESTORER)

(3) Focus control circuit
(VOLTAGE DIVIDER, CHOPPER 2, DC RESTORER 2, focus and intensity control circuit)

(4) CRT

(5) Others
(TRACE ROTATION, ASTIG)

The circuit operations of the above blocks (1), (2), and (3) are described below. For details, refer to the schematic diagram HV, Z, CRT ⑩ .

(1) High voltage generation circuit and the voltage regulator circuit

(a) Voltage controlled oscillator (VCO)
The VCO supplies a positive pulse voltage from the collector of TR1002 by turning on and off TR1001 and TR1002 alternately. When the power switch is turned on, TR1001 becomes on, and C1004 starts to be charged through R1004. The charging voltage of C1004 rises the emitter voltage of TR1002 and then TR1002 becomes on. C1004 discharges immediately after TR1002 becomes on, the emitter voltage of TR1001 drops, and TR1001 becomes off. Then, C1004 is charged in the opposite direction through R1003, the emitter voltage of TR1001 rises, and TR1001 becomes on. These operations are repeated to continue generating the positive pulse.

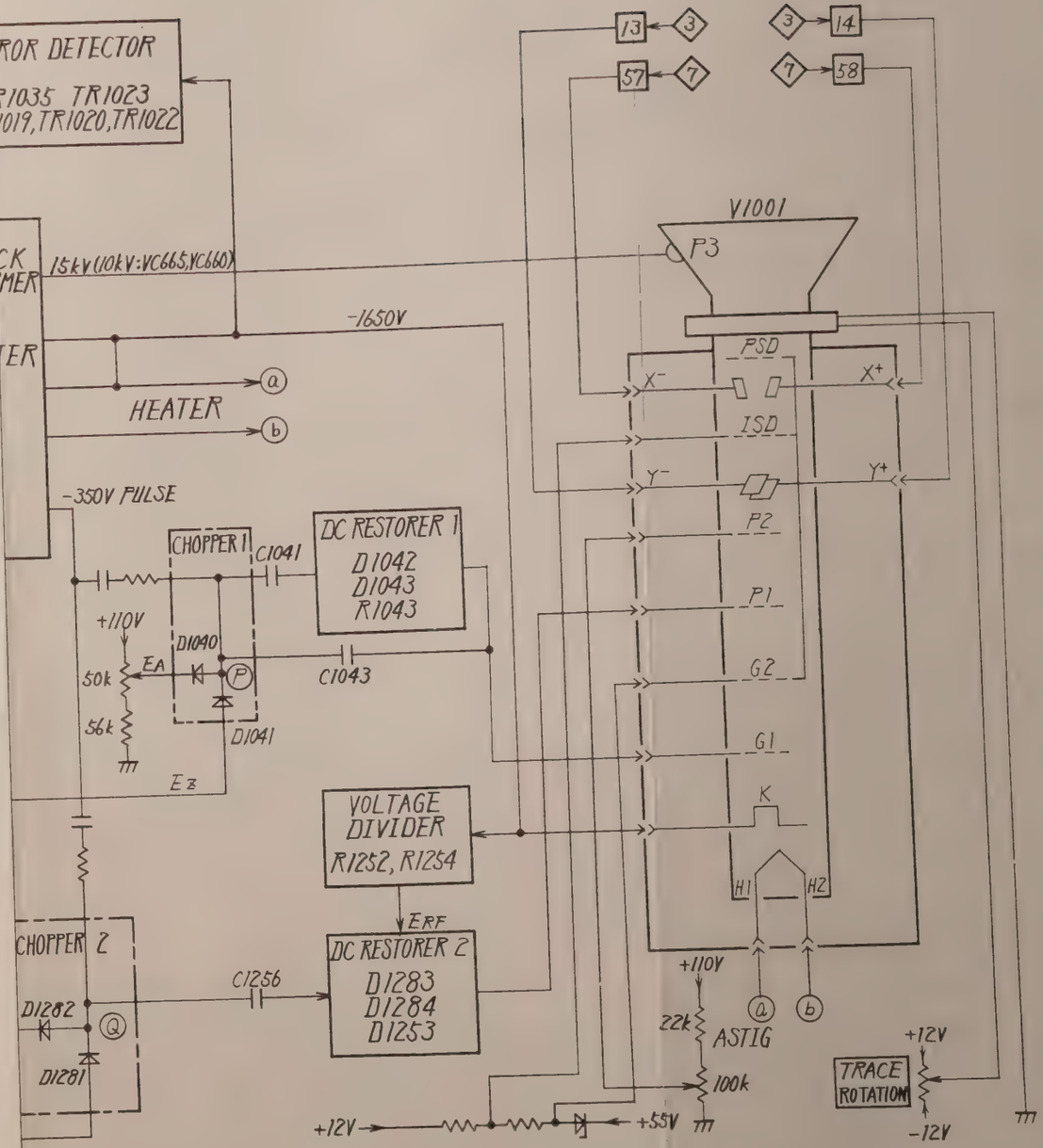


Fig. 5-9

5.11 POWER (◇11◇)

Outline

This circuit is a power supply circuit using a switching regulator, and uses hybrid IC IC1501 (STK7308) as a switching circuit. Figure 5-10 is the simplified circuit diagram of this circuit.
When switching transistor TR5 in IC1501 is on, the energy is stored in pulse transformer T1501 by the collector current. The stored energy is emitted to the secondary circuit while TR5 is off. The feedback loop circuit controls the duration of the on and off periods to control the transfer amount of energy, ie, to stabilize the output.
The description of the major functions follows.
(1) Switching operation
(2) Stabilizing operation of output
(3) Protection circuit of switching transistor

(1) Switching operation

The on and off operation is described.

(i) When the power switch is turned to on, the positive voltage is applied to the base of switching transistor TR5 in IC1501 via starting resistors R1503 and R1504, and TR5 is turned to on. Thus, the collector current Ic flows to the primary winding N1 of T1501.

(ii) The voltage induced between terminals ② (positive) and ③ (negative) turns TR4 to on, increases the base current of TR5, and increases the collector current Ic.

(iii) When the collector current Ic of TR5 reaches to saturation, the induced voltage of N2 turns to zero, and TR5 turns to off.

(iv) The energy stored in T1501 becomes a current and fed to the secondary wiring N4 (N5 through N8), and is emitted through D1513.

(v) The voltage induced at N2 (terminal ② : positive) turns TR5 on again.

The above operations are repeated.

The collector current of TR4, ie, the base current of TR5, becomes the constant-current controlled by zener diode D1514 and resistor R9 in IC1501. (ZD3 is off because the zener voltage of zener diode D1514 is 2.4 V, and that of zener diode ZD3 in IC1501 is 5.1 V.)
When the positive feedback induced at N2 exceeds the fixed value, D1515 is conducted and then TR1514 is turned to on.
Thus, the base current of TR4 is decreased, the collector current of TR4, ie, the base current of TR5 is also decreased, and the collector current of TR5 is decreased.
These operations prevent the collector current of TR5 from flowing excessively.

(2) Stabilizing operation of output

The DC voltage (approx. -28V) is produced by rectifying the AC voltage fed back from winding N4 to windings N2 and N3 when TR5 is off. This DC voltage is divided, and added to the base of ERROR DETECTOR TR1 to stabilize the voltage of regulator output. In other words, the emitter potential of TR1 maintained constant by zener diode ZD1 is compared with the base potential of TR1 and the error signal is detected. This error signal is amplified by TR2, and supplied to the base of TR3, and the collector current of TR3 is thus controlled.

When the output voltage of the regulator rises, the collector current of TR3 increases, and the base current of TR4 is decreased.

Consequently, the base current of TR5 is also decreased and the saturation point of the collector current of TR5 is decreased. In other words, the amount of energy transferred to the secondary circuits of T1501 is reduced by making the on-duration of TR5 short. The voltage across R1502 is supplied to the base of TR2 through R1507 to match the timing to turn TR5 to off, ie, the timing to control the collector current of TR3 with the timing of the peak of the collector current of TR5.

(3) Protection circuit of the switching transistor

Circuit protection after turning power to on

(i) Immediately after the power switch is turned to on, triac thyristor D1502 is off, and the charging current of C1508 (and C1509) flows to R1501. This prevents the rush current from doing damage to the circuits.
The voltage induced at N2 is supplied to D1502 as a negative trigger pulse. Then, D1502 turns to on, and this power circuit becomes a steady state.

(ii) Immediately after the power switch is turned to on, the base voltage of TR1 is much higher than the emitter voltage of TR1, compared with the steady operation state, because the charging speed of C1508 and C1507 is different.
As a result, the collector current of TR3 increases, and the base current of TR4 decreases. The base current of TR5 decreases, and the collector current of TR5 is limited to a small amount. After C1508 and C1507 are charged, this power circuit becomes a steady state.

Circuit for protecting the excessive current

D1502 is a 3.0 V zener diode, and determines the upper limit of the base current of TR5 together with D1503 and R1502. This prevents the excessive current from flowing to TR5.

Others

The LINE TRIG signal for the line lock is taken out from the primary line. After the signal passes through photo coupler IC1519, the waveform is shaped and supplied to the TRIG circuit via 15 .

When the output voltage of the regulator rises, the collector current of TR3 increases, and the base current of TR4 is decreased.

Consequently, the base current of TR5 is also decreased and the saturation point of the collector current of TR5 is decreased. In other words, the amount of energy transferred to the secondary circuits of T1501 is reduced by making the on-duration of TR5 short. The voltage across R1502 is supplied to the base of TR2 through R1507 to match the timing to turn TR5 to off, ie, the timing to control the collector current of TR3 with the timing of the peak of the collector current of TR5.

(3) Protection circuit of the switching transistor

Circuit protection after turning power to on

(i) Immediately after the power switch is turned to on, triac thyristor D1502 is off, and the charging current of C1508 (and C1509) flows to R1501. This prevents the rush current from doing damage to the circuits.
The voltage induced at N2 is supplied to D1502 as a negative trigger pulse. Then, D1502 turns to on, and this power circuit becomes a steady state.

(ii) Immediately after the power switch is turned to on, the base voltage of TR1 is much higher than the emitter voltage of TR1, compared with the steady operation state, because the charging speed of C1508 and C1507 is different.
As a result, the collector current of TR3 increases, and the base current of TR4 decreases. The base current of TR5 decreases, and the collector current of TR5 is limited to a small amount. After C1508 and C1507 are charged, this power circuit becomes a steady state.

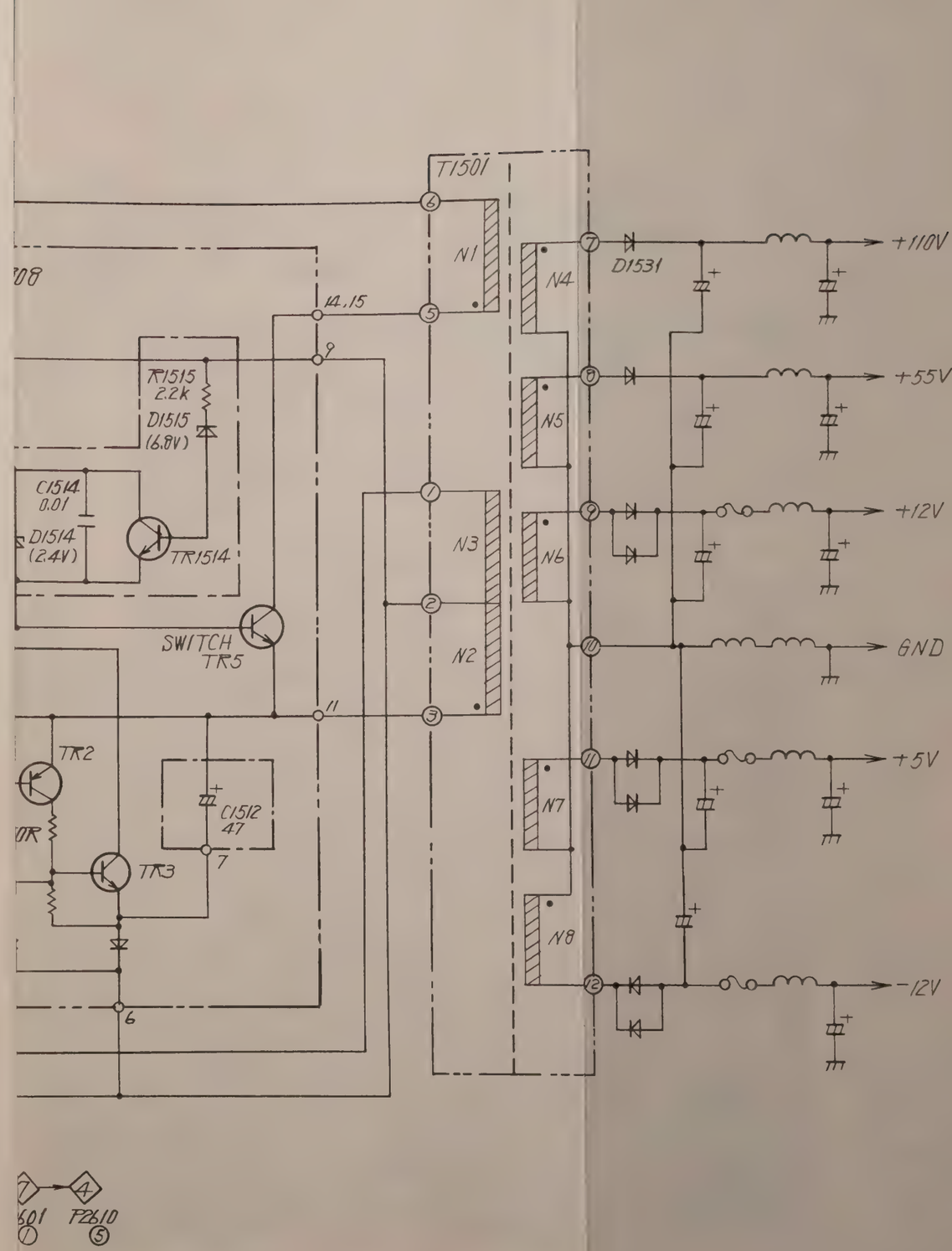
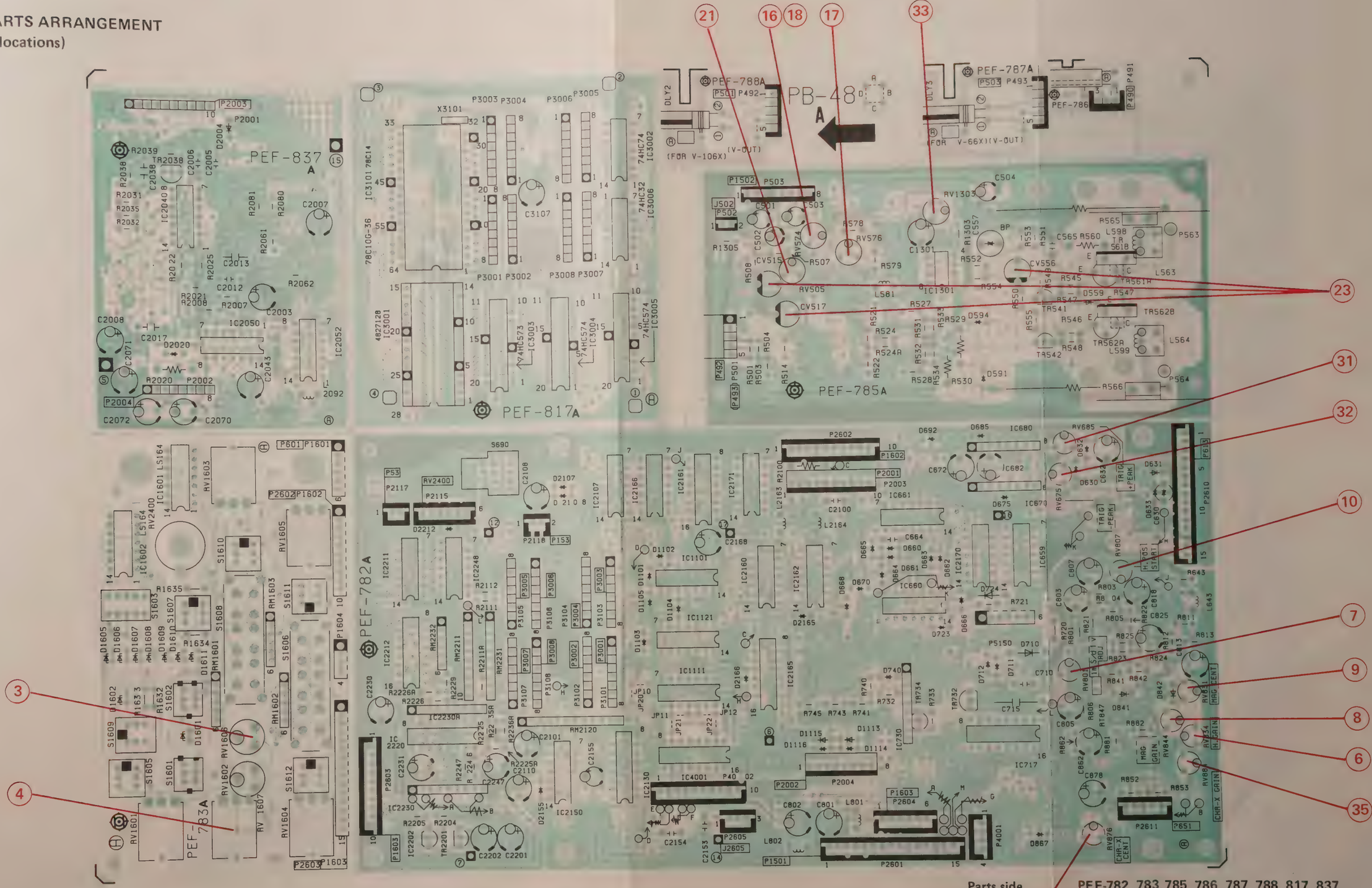


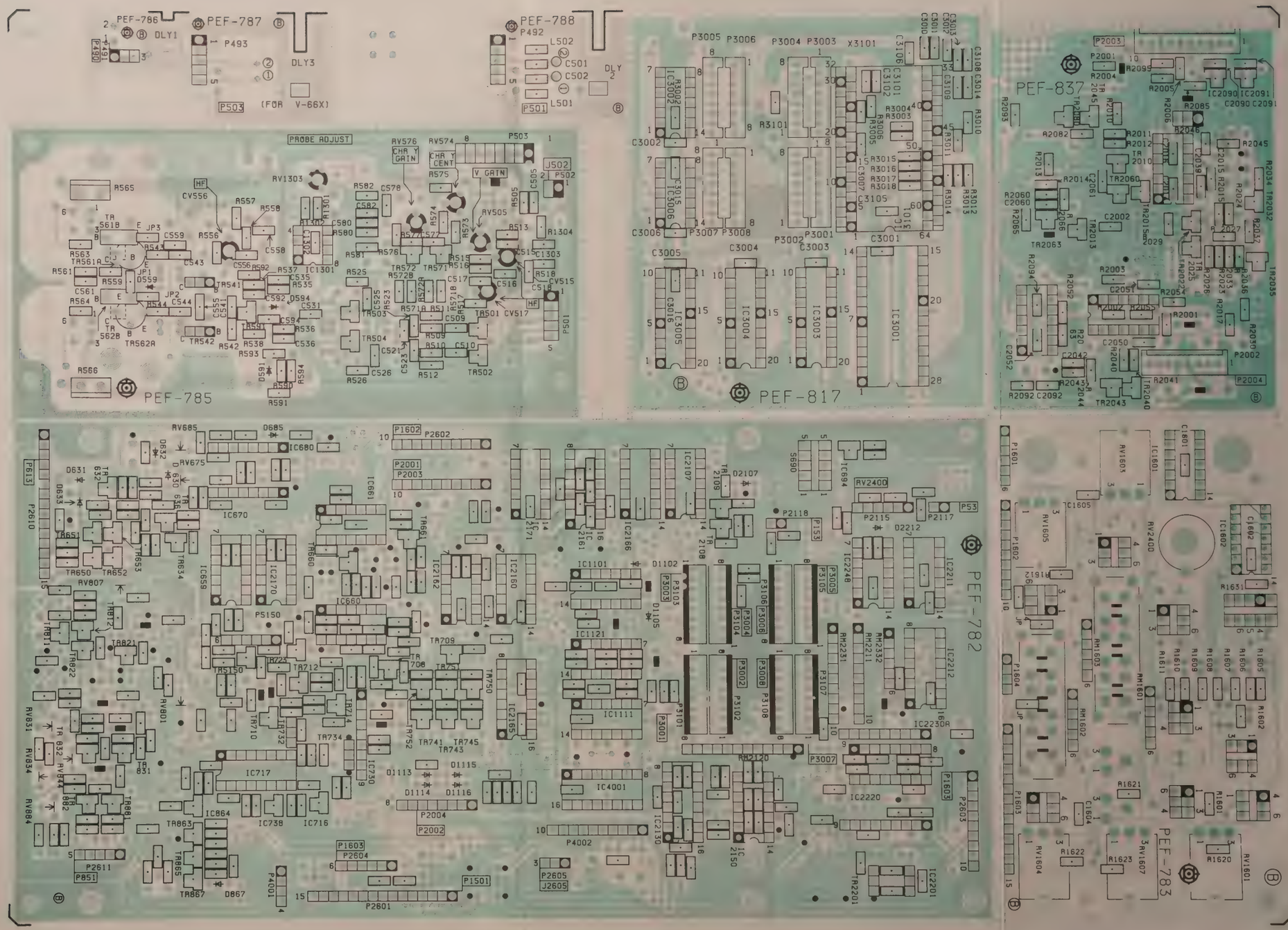
Fig. 5-10

6. ELECTRICAL PARTS ARRANGEMENT
(With adjustment locations)



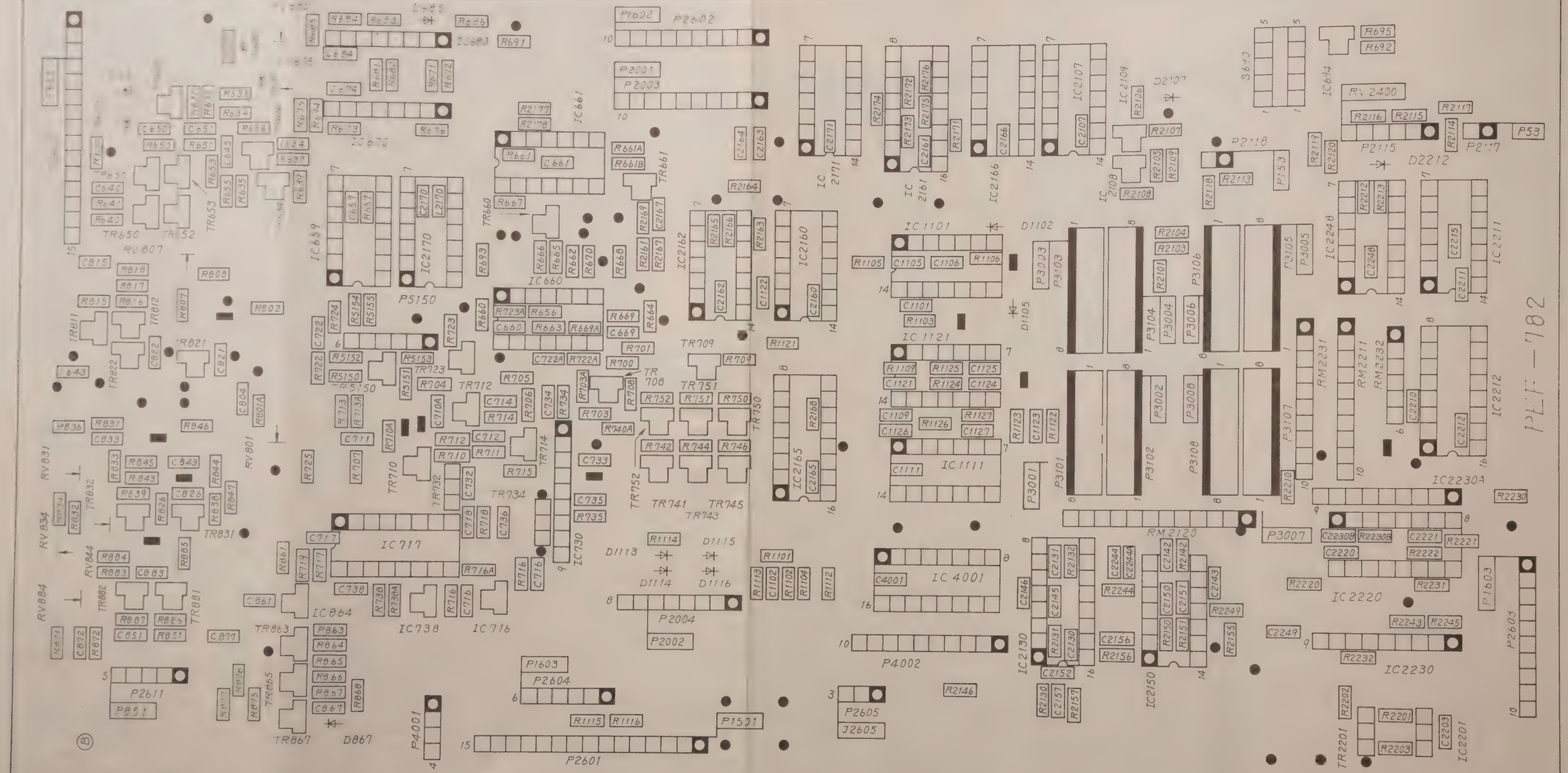
Parts side

PEF-782, 783, 785, 786, 787, 788, 817, 837



Soldering side

PEF-782, 783, 785, 786, 787, 788, 817, 837


P1002
P2602
P2001
P2003
IC661
IC2171
IC2161
IC2166
IC2107
IC2109
IC2108
S610
IC644
R695
R692
RV 2400
P2115
D2212
P53
IC2212
IC2211
IC2248
IC2160
IC2162
IC1101
D1102
P3003
P3103
P3104
P3004
P3006
P3105
P3005
P3106
P3002
P3008
P3107
P3101
P3102
P3001
IC1121
IC1111
IC 4001
P4002
IC2130
IC2150
IC2165
IC2230A
IC2220
IC2230
RM2120
P3007
IC2201
P1603
P2603
IC660
IC689
IC2170
P5150
IC717
IC864
IC738
IC716
P2004
P2002
P2604
P1501
P2601
P2605
J2605
P2611
P4001
TR650
TR652
TR653
RV 807
TR811
TR822
TR821
RV 831
RV 834
RV 844
TR832
TR831
TR802
TR881
TR863
TR865
TR867
D867
TR723
TR712
TR710
TR732
TR734
TR714
TR730
TR752
TR741
TR745
TR743
TR709
TR708
TR751
TR750
TR661
TR660
RV 801
D1113
D1114
D1115
D1116
TR2201
IC2201
P2202
P2201
P2203
P2204
P2205
P2206
P2207
P2208
P2209
P2210
P2211
P2212
P2213
P2214
P2215
P2216
P2217
P2218
P2219
P2220
P2221
P2222
P2223
P2224
P2225
P2226
P2227
P2228
P2229
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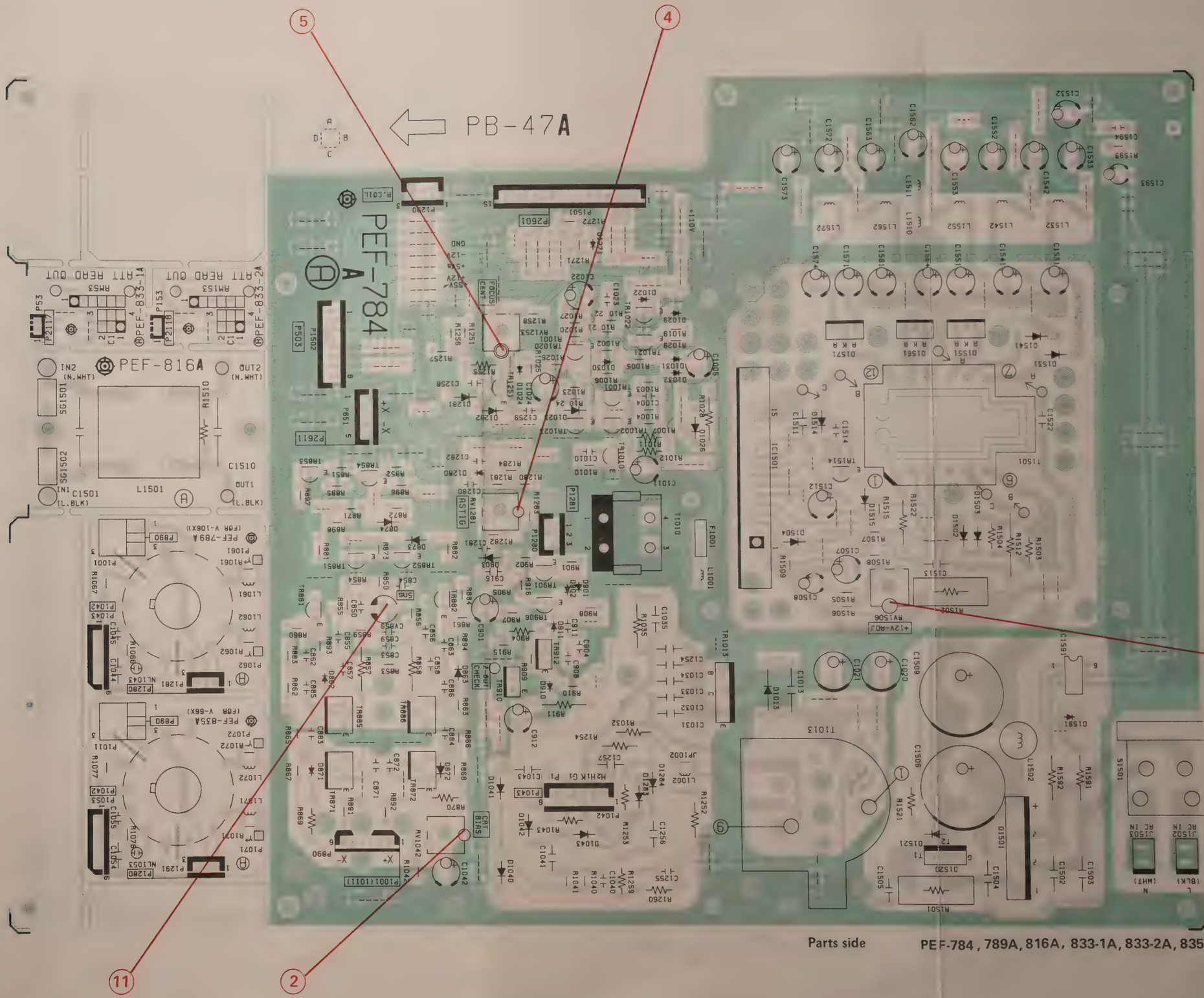
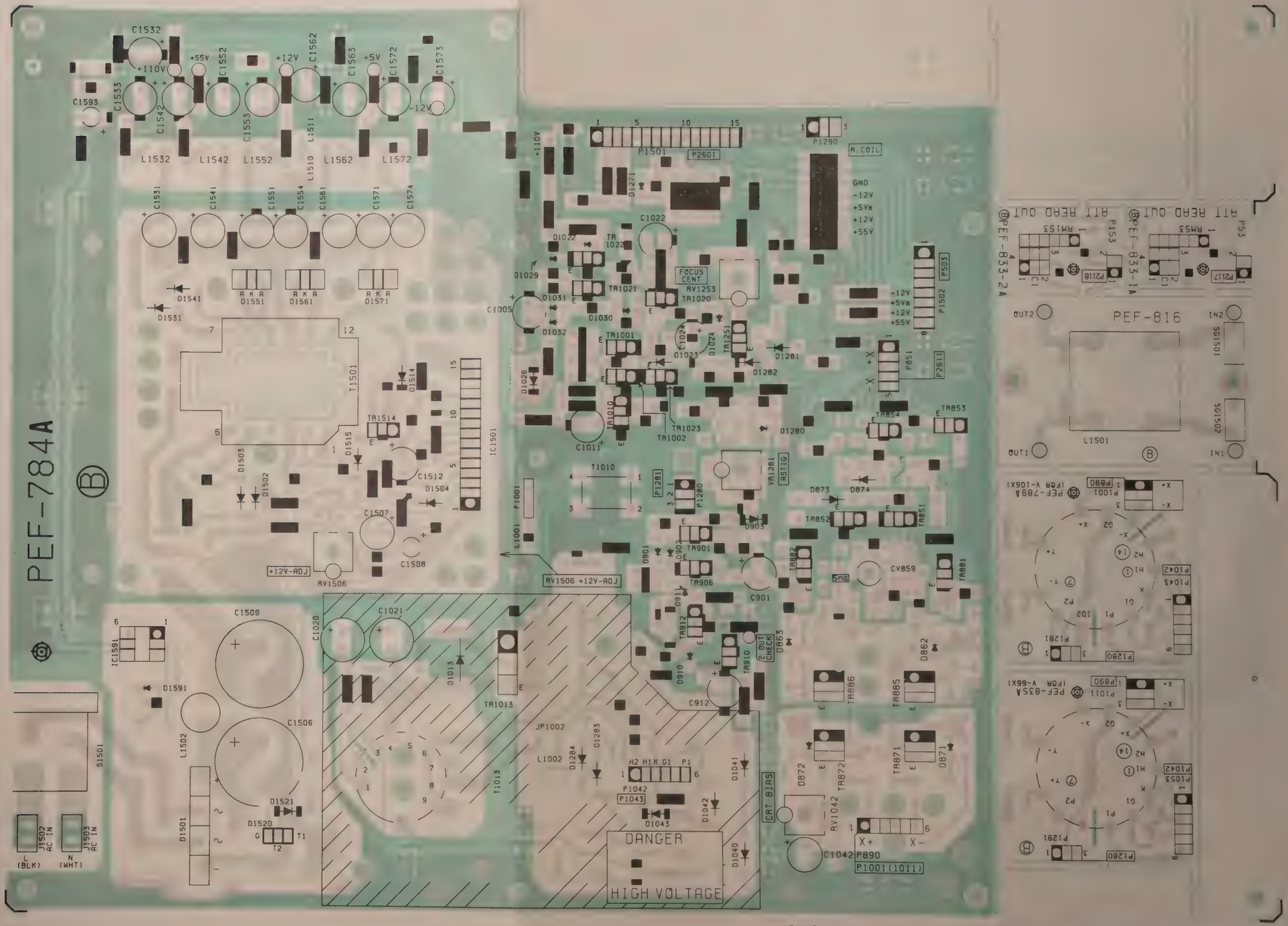
P2237
P2238
P2239
P2240
P2241
P2242



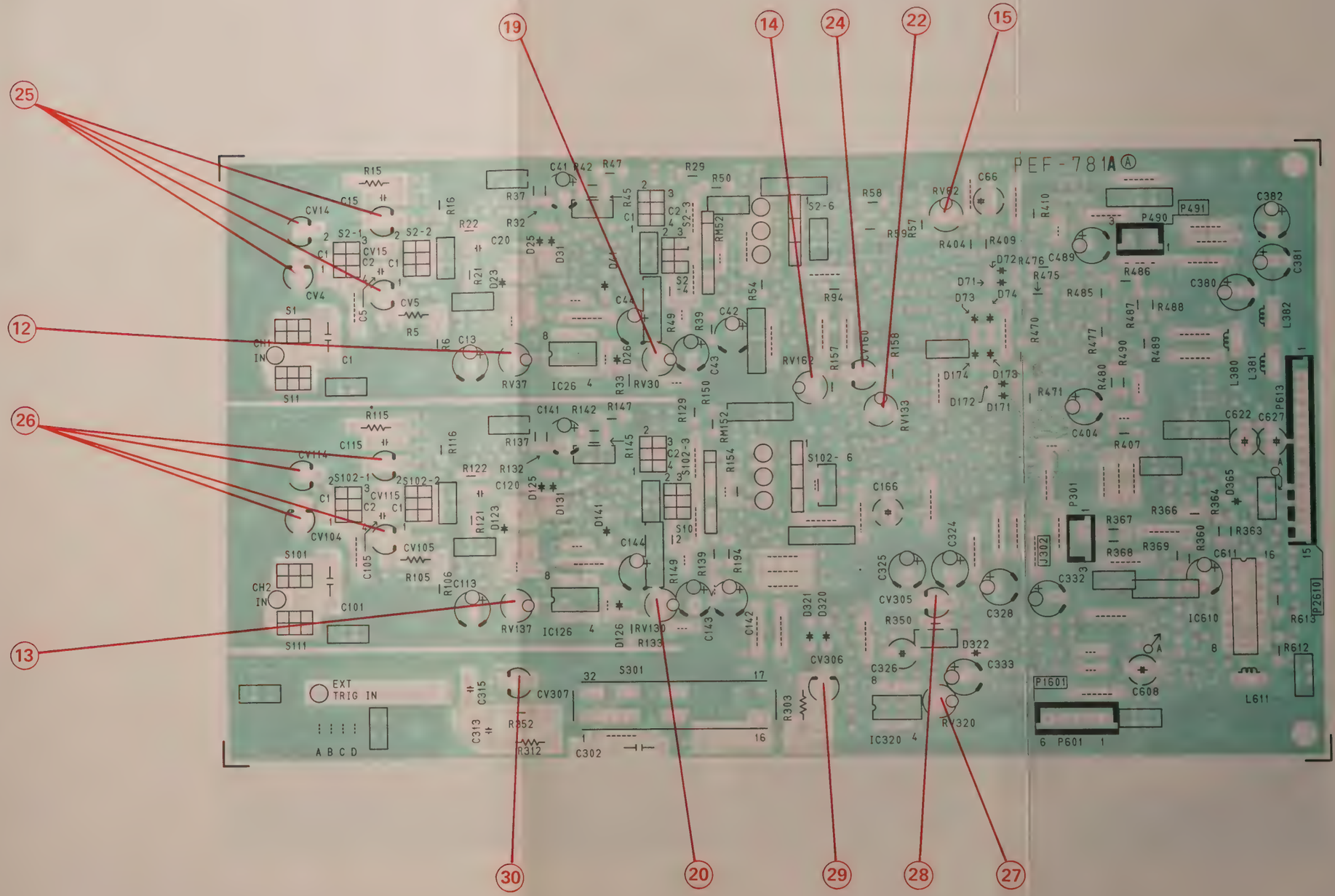
Parts side

PEF-784 , 789A, 816A, 833-1A, 833-2A, 835A



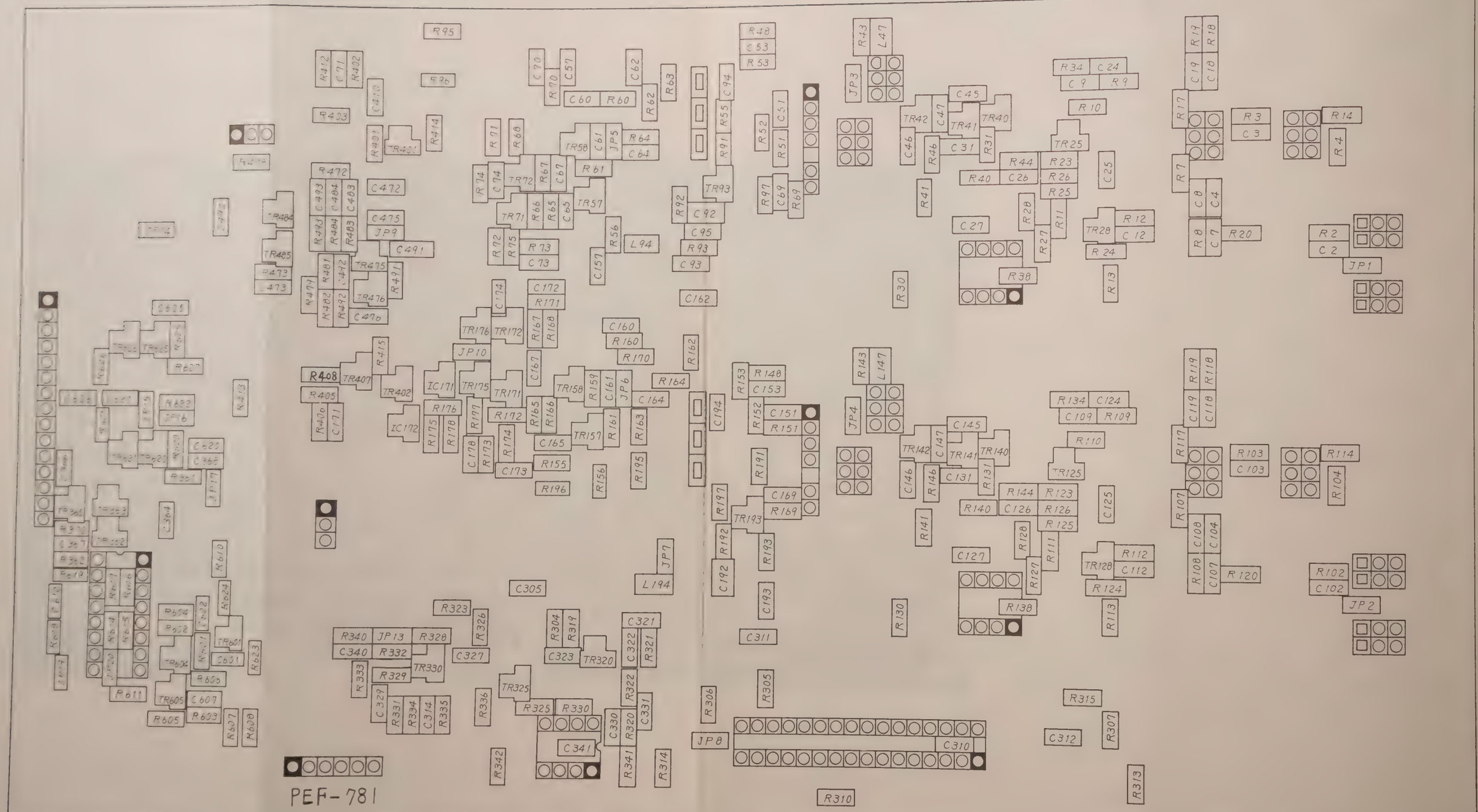
Soldering side

PEF-784 , 789A, 816A, 833-1A, 833-2A, 835A



Parts side PEF-781

CH1 POS CENT
CH1 VAR
S2-6
S2-3
CH1 1/100 HF COMP
CV15
CH2 1/100CI COMP.
RV62
TR58
TR72
P491
P490
TR401
TR484
TR485
TR475
TR71
TR57
TR93
TR41
TR40
TR42
TR25
S2-4
S2-2
CV14
CV4
CV5
CH1 1/10 CI COMP
S1
CH1 IN
S11
CH1 1/10 HF COMP
IC26
TR28
RV30
CV160
CH2HF COMP
CH1 DC GAIN
CH1 DC BAL
RV37
P2610
TR625
TR626
TR476
TR176
TR407
IC171
TR175
TR158
TR171
CH2POS CENT
RV162
S102-6
S102-3
CH2 1/100 HF COMP
CH2 1/100 CI COMP
CV115
CV114
S102-2
S102-1
TR140
TR142
TR141
TR157
CH2 VAR
R193
TR125
S102-4
CV104
CV105
CH2 1/10 CI COMP
S101
CH2 IN
S111
CH2 1/10 HF COMP
RV130
IC126
TR128
CH2 DC GAIN
CH2 DC BAL
RV137
P613
TR365
TR620
TR363
TR362
TR521
TR402
IC172
J302
P301
CH2GAIN
CV305
INT HF COMP
TR320
TR325
TR601
TR614
TR330
IC610
TR605
P601
P1601
RV320
IC320
DC BAL TRIG
CV306
EXT 1/1 HF COMP
S301
CV307
EXT 1/10 HF COMP
EXT TRIG IN
PEF-781A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R412
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R402
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R415
R408
TR407
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C171
TR402
IC171
IC172
R176
R175
R178
C178
R173
R174
C173
R177
TR176
TR172
JP10
TR175
TR171
R172
C174
C172
R171
R167
R168
C167
R165
R166
C165
R155
R196
C70
R70
C51
C62
C60
R60
R62
R63
R71
R68
R74
C74
TR72
R67
C67
R61
TR58
C61
JP5
R64
C64
TR71
R66
R65
C65
TR57
R72
R75
R73
C73
C157
R56
L94
C160
R160
R170
R162
R164
C164
R158
R159
C161
JP6
TR157
R161
R163
R195
R156
R48
C53
R53
C94
R55
R91
TR93
R52
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R51
R97
C69
R69
R92
C92
C95
R93
C93
C162
C194
R153
R148
C153
R152
C151
R151
R191
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C311
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R306
JP8
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R315
C312
R307
R313
JP3
R43
L47
C45
TR42
C47
TR41
TR40
C46
R46
C31
R31
R41
R34
C24
C9
R9
R10
TR25
R44
R23
R40
C26
R26
R25
C25
R28
R27
R11
C27
R38
TR28
R12
C12
R24
R13
R30
JP4
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L147
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TR142
C147
TR141
TR140
C146
R146
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R141
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C109
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TR125
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R123
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C126
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C125
R128
R127
R111
C127
R138
TR128
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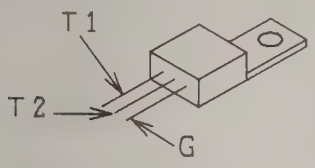
C112
R124
R113
R130
R117
C19
R19
C10
R18
R17
R3
C3
R14
R4
R7
C8
C4
R8
C7
R20
R2
C2
JP1
R107
C108
C104
R120
R103
C103
R114
R104
R102
C102
JP2
R323
R326
C327
R340
JP13
R328
C340
R332
R329
TR330
R333
C329
R331
R334
C314
R335
R336
R304
R319
C323
TR320
C321
C322
R321
R322
R320
C331
C330
C341
R342
R314
TR325
R325
R330
JP7
L194
C305

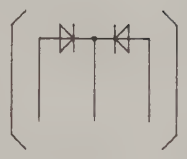
PEF-781

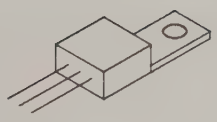
7. ELECTRICAL PARTS LEAD CONFIGURATIONS

Diode

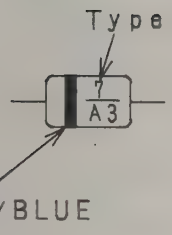


DTA10E

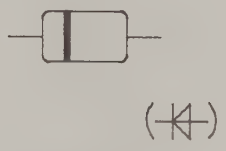




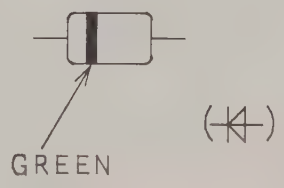
FML-12S
FML-24



HZ7A3
HZ12B
HZ7B-2

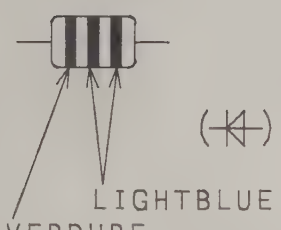


GZB 2.4B
GZB 3.0B
GZB 6.8B



MA161

MTZ 3.3JA
MTZ 4.7JB
MTZ 7.5JC
MTZ 6.8JC



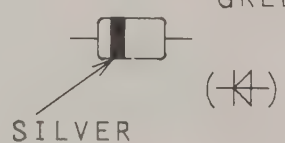
1SS83

(For detailes, see bellow)

1SS133 YELLOW
1SS110 VERDURE
1SS165 DARKHOLLY GREEN

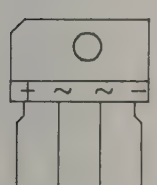
S5566B

RU3AMLF

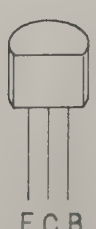


AU01

Transistor



RBV-406



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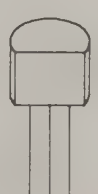
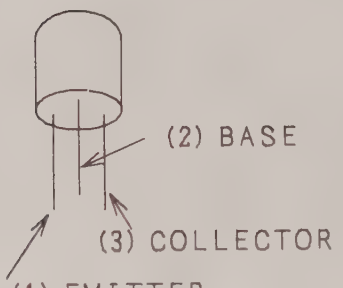
2SA1029D
2SA1188E
2SC535C
2SC641K
2SC1213AC
2SC1906
2SC2853E

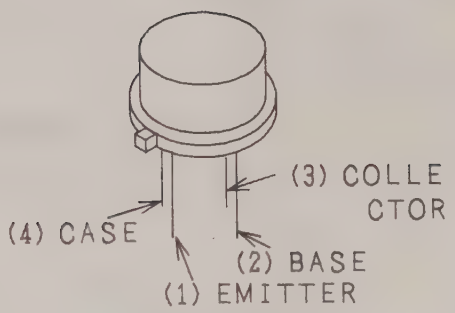


2SC2407 (1)

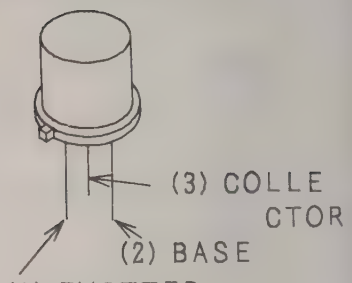
Transistor



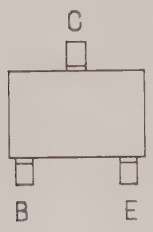
2SA458C



2SC1164



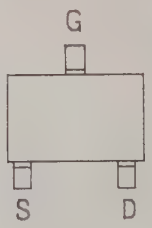
2SC1252



(TOP VIEW)

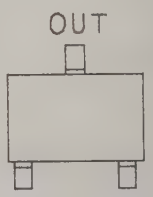
2SA1245
2SA1462
2SB624BV3
2SC1621B4
2SC2462LC
2SC2620QC
2SC2735JC
2SC3772LY4
2SC3775OY-4
2SD596DV3

2SA1052
2SA1226E4

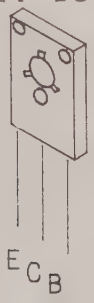


(TOP VIEW)

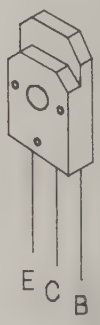
2SK303V4
2SK436A20
2SK508K52



DTA124EK

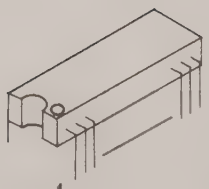


2SA1210S
2SC2912S



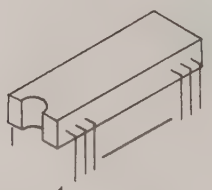
2SC3090

IC



16PINS

MC74HC4052N
MC74HC4053N



14PINS

HD74LS00P
HD74LS04P
HD74LS10P
HD74LS74AP
HD74LS164P
HD74LS393P

HD74HC00P
HD74HC32P
HD74HC74P
TC40H000P
TC40H002P
TC40H164P

16PINS

HD14040BP
HD14051BP

HD14053BP
MC10H116L
TC40H151P

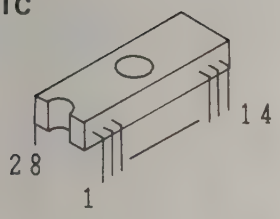
20PINS

HD74HC573P
HD74HC574P

64PINS

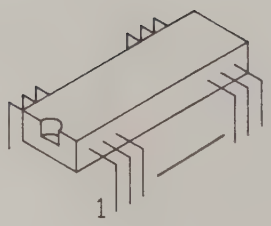
μPD78C10G-36

IC



28PINS

NH4827128G-25

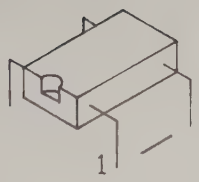


14PINS

SN74AS00N
SN74AS74N
TL064CN

16PINS

SN74LS594N



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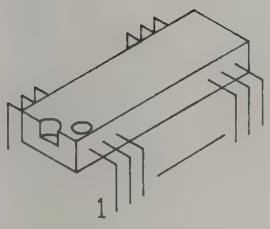
MN3102



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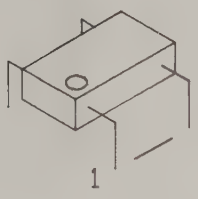
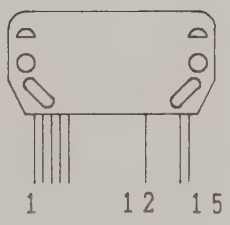


6PINS

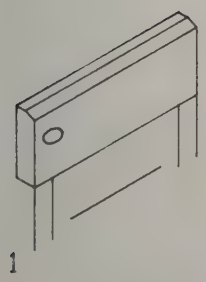
PC714U

8PINS

TL081CP

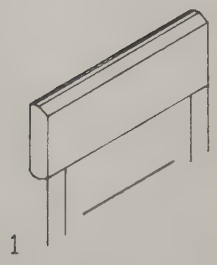


STK7308



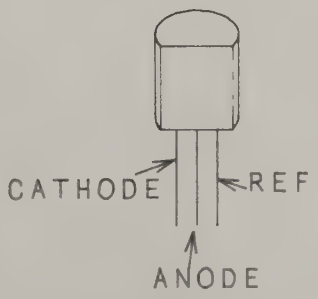
9PINS

NJM072S



8PINS

M5201L



TL431CLP-B

8. ELECTRICAL PARTS LIST

PEF-781 V-PRE & TRIG AMP

A:V-660, B:V-665
C:V-1060, D:V-1065

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
C1	CQM0431	C,Plastic 400V 0.047μF ±10%	1	1	1	1		
C2	CCG0128	C,Ceramic,Chip 50V 15pF ±5%	1	1	1	1		
C3	CCG0128	C,Ceramic,Chip 50V 15pF ±5%	1	1	1	1		
C5	CCD0274	C,Ceramic 500V 3pF ±0.25pF	1	1	1	1		
C8	CCG0136	C,Ceramic,Chip 50V 33pF ±5%	1	1	1	1		
C9	CCG0116	C,Ceramic,Chip 50V 2pF ±0.25pF	1	1	1	1		
C12	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C13	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C15	CCD0272	C,Ceramic 500V 1pF ±0.25pF	1	1	1	1		
C18	CCG0144	C,Ceramic,Chip 50V 220pF ±5%	1	1	1	1		
C19	CCG0142	C,Ceramic,Chip 50V 82pF ±5%	1	1	1	1		
C20	CCD0286	C,Ceramic 500V 1000pF +100% -0%	1	1	1	1		
C24	CCG0126	C,Ceramic,Chip 50V 12pF ±5%	1	1	1	1		
C25	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C26	CCG0128	C,Ceramic,Chip 50V 15pF ±5%	1	1	1	1		
C27	CCG0201	C,Ceramic,Chip 50V 470pF ±5%	1	1	1	1		
C31	CCG0116	C,Ceramic,Chip 50V 2pF ±0.25pF			1	1		
C31	CCG0119	C,Ceramic,Chip 50V 5pF ±0.25pF	1	1				
C41	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C42	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C43	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C44	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C45	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C46	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C47	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C51	CCG0119	C,Ceramic,Chip 50V 5pF ±0.25pF	1	1	1	1		
C53	CCG0121	C,Ceramic,Chip 50V 7pF ±0.5%	1	1	1	1		
C57	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C60	CCG0120	C,Ceramic,Chip 50V 6pF ±0.5pF	1	1	1	1		
C61	CCG0136	C,Ceramic,Chip 50V 33pF ±5%			1	1		
C62	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C65	CCG0203	C,Ceramic,Chip 50V 680pF ±5%	1	1	1	1		
C66	CEX0189	C,Al Elyc 16V 10μF ±20% BP	1	1	1	1		
C67	CCG0203	C,Ceramic,Chip 50V 680pF ±5%	1	1	1	1		
C69	CCG0120	C,Ceramic,Chip 50V 6pF ±0.5pF	1	1	1	1		
C70	CCG0117	C,Ceramic,Chip 50V 3pF ±0.25pF	1	1	1	1		
C71	CCG0117	C,Ceramic,Chip 50V 3pF ±0.25pF	1	1	1	1		
C73	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C74	CCG0116	C,Ceramic,Chip 50V 2pF ±0.25pF	1	1	1	1		
C92	CMU0047	C,Mica,Chip 500V 27pF ±1%	1	1	1	1		
C93	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C94	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C95	CCG0176	C,Ceramic,Chip 50V 1pF ±0.25pF	1	1	1	1		
C101	CQM0431	C,Plastic 400V 0.047μF ±10%	1	1	1	1		
C102	CCG0128	C,Ceramic,Chip 50V 15pF ±5%	1	1	1	1		
C103	CCG0128	C,Ceramic,Chip 50V 15pF ±5%	1	1	1	1		
C105	CCD0274	C,Ceramic 500V 3pF ±0.25pF	1	1	1	1		
C108	CCG0136	C,Ceramic,Chip 50V 33pF ±5%	1	1	1	1		
C109	CCG0116	C,Ceramic,Chip 50V 2pF ±0.25pF	1	1	1	1		
C112	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C113	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C115	CCD0272	C,Ceramic 500V 1pF ±0.25pF	1	1	1	1		
C118	CCG0144	C,Ceramic,Chip 50V 220pF ±5%	1	1	1	1		
C119	CCG0142	C,Ceramic,Chip 50V 82pF ±5%	1	1	1	1		
C120	CCD0286	C,Ceramic 500V 1000pF +100% -0%	1	1	1	1		
C124	CCG0126	C,Ceramic,Chip 50V 12pF ±5%	1	1	1	1		
C125	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C126	CCG0128	C,Ceramic,Chip 50V 15pF ±5%	1	1	1	1		
C127	CCG0201	C,Ceramic,Chip 50V 470pF ±5%	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
C131	CCG0116	C,Ceramic,Chip 50V 2pF ±0.25pF			1	1		
C131	CCG0119	C,Ceramic,Chip 50V 5pF ±0.25pF	1	1				
C141	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C142	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C144	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C145	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C146	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C147	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C151	CCG0119	C,Ceramic,Chip 50V 5pF ±0.25pF	1	1	1	1		
C153	CCG0121	C,Ceramic,Chip 50V 7pF ±0.25pF	1	1	1	1		
C157	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C161	CCG0136	C,Ceramic,Chip 50V 33pF ±5%			1	1		
C162	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C165	CCG0203	C,Ceramic,Chip 50V 680pF ±5%	1	1	1	1		
C166	CEX0189	C,Al Elyc 16V 10μF ±20% BP	1	1	1	1		
C167	CCG0203	C,Ceramic,Chip 50V 680pF ±5%	1	1	1	1		
C169	CCG0120	C,Ceramic,Chip 50V 6pF ±0.5pF	1	1	1	1		
C171	CCG0117	C,Ceramic,Chip 50V 3pF ±0.25pF	1	1	1	1		
C172	CCG0117	C,Ceramic,Chip 50V 3pF ±0.25pF	1	1	1	1		
C173	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C174	CCG0117	C,Ceramic,Chip 50V 3pF ±0.25pF	1	1	1	1		
C178	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C192	CMU0047	C,Mica,Chip 500V 27pF ±1%	1	1	1	1		
C193	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C194	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C302	CQM0431	C,Plastic 400V 0.047μF ±10%	1	1	1	1		
C305	CCG0117	C,Ceramic,Chip 50V 6pF ±0.25pF	1	1	1	1		
C310	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C311	CCG0119	C,Ceramic,Chip 50V 5pF ±0.25pF	1	1	1	1		
C312	CCG0136	C,Ceramic,Chip 50V 33pF ±5%	1	1	1	1		
C313	CCD0275	C,Ceramic 500V 5pF ±0.25pF	1	1	1	1		
C315	CCD0277	C,Ceramic 500V 10pF ±0.5pF	1	1	1	1		
C321	CCG0138	C,Ceramic,Chip 50V 39pF ±5%	1	1	1	1		
C322	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C323	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C324	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C325	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C326	CES0252	C,Al Elyc 16V 10μF ±20% BP	1	1	1	1		
C327	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C328	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C329	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C331	CCG0176	C,Ceramic,Chip 50V 1pF ±0.25pF	1	1	1	1		
C332	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C333	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C341	CCG0201	C,Ceramic,Chip 50V 470pF ±5%	1	1	1	1		
C364	CCG0116	C,Ceramic,Chip 50V 5pF ±0.25pF	1	1	1	1		
C366	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C367	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C368	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C380	CES0378	C,Al Elyc 16V 330μF ±20%	1	1	1	1		
C381	CES0379	C,Al Elyc 10V 470μF ±20%	1	1	1	1		
C382	CES0378	C,Al Elyc 16V 330μF ±20%	1	1	1	1		
C404	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C410	CCG0205	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C472	CCG0119	C,Ceramic,Chip 50V 5pF ±0.25pF			1	1		
C472	CCG0121	C,Ceramic,Chip 50V 7pF ±0.5pF	1	1				
C473	CCG0119	C,Ceramic,Chip 50V 5pF ±0.25pF			1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
C473	CCG0121	C,Ceramic,Chip 50V 7pF ±0.25pF	1	1				
C475	CCG0176	C,Ceramic,Chip 50V 1pF ±0.25pF	1	1				
C476	CCG0176	C,Ceramic,Chip 50V 1pF ±0.25pF	1	1				
C483	CCG0194	C,Ceramic,Chip 50V 120pF ±5%	1	1	1	1		
C484	CCG0186	C,Ceramic,Chip 50V 22000pF ±20%	1	1	1	1		
C489	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C490	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C491	CCG0122	C,Ceramic,Chip 50V 8pF ±0.5pF			1	1		
C492	CCG0119	C,Ceramic,Chip 50V 5pF ±0.25pF	1	1				
C492	CCG0128	C,Ceramic,Chip 50V 15pF ±5%			1	1		
C493	CCG0136	C,Ceramic,Chip 50V 33pF ±5%	1	1	1	1		
C601	CCG0143	C,Ceramic,Chip 50V 100pF ±5%	1	1	1	1		
C602	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C607	CCG0217	C,Ceramic,Chip 50V 0.047μF ±10%	1	1	1	1		
C608	CES0252	C,Al Elyc 16V 10μF ±20% BP	1	1	1	1		
C610	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C611	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C620	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C621	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C622	CES0252	C,Al Elyc 16V 10μF ±20% BP	1	1	1	1		
C625	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C626	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C627	CES0252	C,Al Elyc 16V 10μF ±20% BP	1	1	1	1		
CV4	CVT0056	C,Variable TZ03Z100NR169 (10P)	1	1	1	1		
CV5	CVT0053	C,Variable TZ03Z2R3NR169 (2.3P)	1	1	1	1		
CV14	CVT0056	C,Variable TZ03Z100NR169 (10P)	1	1	1	1		
CV15	CVT0053	C,Variable TZ03Z2R3NR169 (2.3P)	1	1	1	1		
CV104	CVT0056	C,Variable TZ03Z100NR169 (10P)	1	1	1	1		
CV105	CVT0053	C,Variable TZ03Z2R3NR169 (2.3P)	1	1	1	1		
CV114	CVT0056	C,Variable TZ03Z100NR169 (10P)	1	1	1	1		
CV115	CVT0053	C,Variable TZ03Z2R3NR169 (2.3P)	1	1	1	1		
CV160	CVT0056	C,Variable TZ03Z100NR169 (10P)	1	1	1	1		
CV305	CVT0053	C,Variable TZ03Z2R3NR169 (2.3P)	1	1	1	1		
CV306	CVT0053	C,Variable TZ03Z2R3NR169 (2.3P)	1	1	1	1		
CV307	CVT0057	C,Variable TZ03T100NR169 (20P)	1	1	1	1		
D23	HDS0477	Diode 1SS110	1	1	1	1		
D25	HDS0477	Diode 1SS110	1	1	1	1		
D26	HDS0477	Diode 1SS110	1	1	1	1		
D31	HDS0477	Diode 1SS110	1	1	1	1		
D41	HDM0141	Diode MTZ7.5JC	1	1	1	1		
D71	HDS0437	Diode 1SS133	1	1	1	1		
D72	HDS0437	Diode 1SS133	1	1	1	1		
D73	HDS0437	Diode 1SS133	1	1	1	1		
D74	HDS0437	Diode 1SS133	1	1	1	1		
D123	HDS0477	Diode 1SS110	1	1	1	1		
D125	HDS0477	Diode 1SS110	1	1	1	1		
D126	HDS0477	Diode 1SS110	1	1	1	1		
D131	HDS0477	Diode 1SS110	1	1	1	1		
D141	HDM0141	Diode MTZ7.5JC	1	1	1	1		
D171	HDS0437	Diode 1SS133	1	1	1	1		
D172	HDS0437	Diode 1SS133	1	1	1	1		
D173	HDS0437	Diode 1SS133	1	1	1	1		
D174	HDS0437	Diode 1SS133	1	1	1	1		
D320	HDS0437	Diode 1SS133	1	1	1	1		
D321	HDS0437	Diode 1SS133	1	1	1	1		
D322	HDM0139	Diode MTZ 3.3JA	1	1	1	1		
D365	HDS0437	Diode 1SS133	1	1	1	1		
IC26	8397023 A	IC,Analog LF411CN	1	1	1	1		
IC126	8397023 A	IC,Analog LF411CN	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
IC171	HTD0161	Transistor,Chip DTC124K	1	1	1	1		
IC172	HTD0161	Transistor,Chip DTC124K	1	1	1	1		
IC320	ILT0037	IC,Analog TL081CP	1	1	1	1		
IC610	IDH0005	IC,Digital HD10116			1	1		
IC610	IDM0575	IC,Digital MC10H116L	1	1				
JP1	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP2	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP3	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP4	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP5	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP6	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP7	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP8	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP9	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP10	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP12	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP13	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP14	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP15	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP16	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP17	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP19	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
JP20	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
L47	TLN0008	Coil 0.39μH 450mA ±20%	1	1	1	1		
L94	TLN0006	Coil 4.7μH 220mA ±20%	1	1	1	1		
L147	TLN0008	Coil 0.39μH 450mA ±20%	1	1	1	1		
L194	TLN0006	Coil 4.7μH 220mA ±20%	1	1	1	1		
L380	TLE0173	Coil ELO607SKI 101K (100μH)	1	1	1	1		
L381	TLE0173	Coil ELO607SKI 101K (100μH)	1	1	1	1		
L382	TLE0173	Coil ELO607SKI 101K (100μH)	1	1	1	1		
P301	JBB0021	Connector B3B-XH-A		1		1		
P490	JBB0021	Connector B3B-XH-A	1	1	1	1		
P601	JBB0022	Connector B6B-XH-A	1	1	1	1		
P613	JBB0024	Connector B15B-XH-A	1	1	1	1		
R2	RME0856	R,Metal,Chip 1/8W 22Ω ±5%	1	1	1	1		
R3	RME0858	R,Metal,Chip 1/8W 33Ω ±5%	1	1	1	1		
R4	RME0862	R,Metal,Chip 1/8W 68Ω ±5%	1	1	1	1		
R5	RMS0043	R,Metal 1/4W 900kΩ ±0.5%	1	1	1	1		
R6	RME1163	R,Metal 1/4W 111kΩ ±0.5%	1	1	1	1		
R7	RME0865	R,Metal,Chip 1/8W 120Ω ±5%	1	1	1	1		
R8	RME0858	R,Metal,Chip 1/8W 33Ω ±5%	1	1	1	1		
R9	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1		
R10	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R11	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R12	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R13	RME0891	R,Metal,Chip 1/8W 18kΩ ±5%	1	1	1	1		
R14	RME0853	R,Metal,Chip 1/8W 12Ω ±5%	1	1	1	1		
R15	RMS0044	R,Metal 1/4W 990kΩ ±0.5%	1	1	1	1		
R16	RME1156	R,Metal 1/4W10.1kΩ ±0.5%	1	1	1	1		
R17	RME0866	R,Metal,Chip 1/8W 150Ω ±5%	1	1	1	1		
R18	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R19	RME0851	R,Metal,Chip 1/8W 6.8Ω ±5%	1	1	1	1		
R21	RME1168	R,Metal 1/4W 500kΩ ±0.5%	1	1	1	1		
R22	RME1168	R,Metal 1/4W 500kΩ ±0.5%	1	1	1	1		
R23	RME1597	R,Metal,Chip 1/8W 10MΩ ±5%	1	1	1	1		
R24	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R25	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R26	RME0868	R,Metal,Chip 1/8W 220Ω ±5%	1	1	1	1		
R27	RME0886	R,Metal,Chip 1/8W 6.8kΩ ±5%	1	1	1	1		

A:V-660, B:V-665
C:V-1060, D:V-1065

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
R28	RME0877	R,Metal,Chip 1/8W 1.2kΩ ±5%	1	1	1	1		
R29	RME1591	R,Metal 1/4W26,7kΩ ±0.5%	1	1	1	1		
R30	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R31	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R33	RME1081	R,Metal 1/4W5.62kΩ ±1%	1	1	1	1		
R34	RME0892	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R37	RME1662	R,Metal 1/4W 301Ω ±0.5%	1	1	1	1		
R38	RME0897	R,Metal,Chip 1/8W 56kΩ ±5%	1	1	1	1		
R39	RCE0768	R,Carbon 1/4W 820Ω ±5%	1	1	1	1		
R40	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R41	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R42	RME1661	R,Metal 1/4W 100Ω ±0.5%	1	1	1	1		
R43	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R44	RME0862	R,Metal,Chip 1/8W 68Ω ±5%	1	1	1	1		
R45	RME1595	R,Metal 1/4W 475Ω ±0.5%	1	1	1	1		
R46	RME0878	R,Metal,Chip 1/8W 1.5kΩ ±5%	1	1	1	1		
R47	RME1663	R,Metal 1/4W 22.1Ω ±0.5%	1	1	1	1		
R48	RME0868	R,Metal,Chip 1/8W 220Ω ±5%	1	1	1	1		
R49	RME1157	R,Metal 1/4W16.0kΩ ±0.5%	1	1	1	1		
R50	RME1596	R,Metal 1/4W24.0kΩ ±0.5%	1	1	1	1		
R51	RME0870	R,Metal,Chip 1/8W 330Ω ±5%	1	1	1	1		
R52	RME0870	R,Metal,Chip 1/8W 330Ω ±5%	1	1	1	1		
R53	RME0865	R,Metal,Chip 1/8W 120Ω ±5%	1	1	1	1		
R54	RME1195	R,Metal 1/4W 110kΩ ±1%	1	1	1	1		
R55	RME0900	R,Metal,Chip 1/8W 100kΩ ±5%	1	1	1	1		
R56	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R57	RME1077	R,Metal 1/4W2.67kΩ ±1%	1	1	1	1		
R58	RME1077	R,Metal 1/4W2.67kΩ ±1%	1	1	1	1		
R59	RME1057	R,Metal 1/4W 56.2Ω ±1%	1	1	1	1		
R60	RME0866	R,Metal,Chip 1/8W 150Ω ±5%	1	1	1	1		
R61	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%			1	1		
R62	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R63	RME0883	R,Metal,Chip 1/8W 3.9kΩ ±5%	1	1	1	1		
R64	RME0862	R,Metal,Chip 1/8W 68Ω ±5%	1	1	1	1		
R65	RME0854	R,Metal,Chip 1/8W 15Ω ±5%	1	1	1	1		
R66	RME0869	R,Metal,Chip 1/8W 270Ω ±5%	1	1	1	1		
R67	RME0854	R,Metal,Chip 1/8W 15Ω ±5%	1	1	1	1		
R68	RME0869	R,Metal,Chip 1/8W 270Ω ±5%	1	1	1	1		
R69	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
R70	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R71	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R72	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R73	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R74	RME0856	R,Metal,Chip 1/8W 22Ω ±5%	1	1	1	1		
R75	RME0861	R,Metal,Chip 1/8W 56Ω ±5%	1	1	1	1		
R91	RME0861	R,Metal,Chip 1/8W 56Ω ±5%	1	1	1	1		
R92	RME0863	R,Metal,Chip 1/8W 82Ω ±5%	1	1	1	1		
R93	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R94	RCE0770	R,Carbon 1/4W 1.2kΩ ±5%	1	1	1	1		
R95	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R96	RME0883	R,Metal,Chip 1/8W 3.9kΩ ±5%	1	1	1	1		
R102	RME0856	R,Metal,Chip 1/8W 22Ω ±5%	1	1	1	1		
R103	RME0858	R,Metal,Chip 1/8W 33Ω ±5%	1	1	1	1		
R104	RME0862	R,Metal,Chip 1/8W 68Ω ±5%	1	1	1	1		
R105	RMS0043	R,Metal 1/4W 900kΩ ±0.5%	1	1	1	1		
R106	RME1163	R,Metal 1/4W 111kΩ ±0.5%	1	1	1	1		
R107	RME0865	R,Metal,Chip 1/8W 120Ω ±5%	1	1	1	1		
R108	RME0858	R,Metal,Chip 1/8W 33Ω ±5%	1	1	1	1		
R109	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1		
R110	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R111	RME8064	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R112	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R113	RME0891	R,Metal,Chip 1/8W 18kΩ ±5%	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
R114	RME0853	R,Metal,Chip 1/8W 12Ω ±5%	1	1	1	1		
R115	RMS0044	R,Metal 1/4W 990kΩ ±0.5%	1	1	1	1		
R116	RME1156	R,Metal 1/4W10.1kΩ ±0.5%	1	1	1	1		
R117	RME0866	R,Metal,Chip 1/8W 150Ω ±5%	1	1	1	1		
R118	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R119	RME0851	R,Metal,Chip 1/8W 6.8Ω ±5%	1	1	1	1		
R121	RME1168	R,Metal 1/4W 500kΩ ±0.5%	1	1	1	1		
R122	RME1168	R,Metal 1/4W 500kΩ ±0.5%	1	1	1	1		
R123	RME1597	R,Metal,Chip 1/8W 10MΩ ±5%	1	1	1	1		
R124	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R125	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R126	RME0868	R,Metal,Chip 1/8W 220Ω ±5%	1	1	1	1		
R127	RME0886	R,Metal,Chip 1/8W 6.8kΩ ±5%	1	1	1	1		
R128	RME0877	R,Metal,Chip 1/8W 1.2kΩ ±5%	1	1	1	1		
R129	RME1591	R,Metal 1/4W26.7kΩ ±0.5%	1	1	1	1		
R130	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R131	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R133	RME1081	R,Metal 1/4W5.62kΩ ±1%	1	1	1	1		
R134	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R137	RME1662	R,Metal 1/4W 301Ω ±0.5%	1	1	1	1		
R138	RME0897	R,Metal,Chip 1/8W 56kΩ ±5%	1	1	1	1		
R139	RCE0768	R,Carbon 1/4W 820Ω ±5%	1	1	1	1		
R140	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R141	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R142	RME1661	R,Metal 1/4W 100Ω ±0.5%	1	1	1	1		
R143	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R144	RME0862	R,Metal,Chip 1/8W 68Ω ±5%	1	1	1	1		
R145	RME1595	R,Metal 1/4W 475Ω ±0.5%	1	1	1	1		
R146	RME0878	R,Metal,Chip 1/8W 1.5kΩ ±5%	1	1	1	1		
R147	RME1663	R,Metal 1/4W 22.1Ω ±0.5%	1	1	1	1		
R148	RME0868	R,Metal,Chip 1/8W 220Ω ±5%	1	1	1	1		
R149	RME1157	R,Metal 1/4W16.0kΩ ±0.5%	1	1	1	1		
R150	RME1596	R,Metal 1/4W24.0kΩ ±0.5%	1	1	1	1		
R151	RME1870	R,Metal,Chip 1/8W 330Ω ±5%	1	1	1	1		
R152	RME0870	R,Metal,Chip 1/8W 330Ω ±5%	1	1	1	1		
R153	RME0865	R,Metal,Chip 1/8W 120Ω ±5%	1	1	1	1		
R154	RME1195	R,Metal 1/4W 110kΩ ±1%	1	1	1	1		
R155	RME0900	R,Metal,Chip 1/8W 100kΩ ±5%	1	1	1	1		
R156	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R157	RME1077	R,Metal 1/4W2.67kΩ ±1%	1	1	1	1		
R158	RME1077	R,Metal 1/4W2.67kΩ ±1%	1	1	1	1		
R159	RME0863	R,Metal,Chip 1/8W 82Ω ±5%	1	1	1	1		
R160	RME0868	R,Metal,Chip 1/8W 220Ω ±5%	1	1	1	1		
R161	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%			1	1		
R162	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R163	RME0883	R,Metal,Chip 1/8W 3.9kΩ ±5%	1	1	1	1		
R164	RME0862	R,Metal,Chip 1/8W 68Ω ±5%	1	1	1	1		
R165	RME0854	R,Metal,Chip 1/8W 15Ω ±5%	1	1	1	1		
R166	RME0869	R,Metal,Chip 1/8W 270Ω ±5%	1	1	1	1		
R167	RME0854	R,Metal,Chip 1/8W 15Ω ±5%	1	1	1	1		
R168	RME0869	R,Metal,Chip 1/8W 270Ω ±5%	1	1	1	1		
R169	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
R170	RME0863	R,Metal,Chip 1/8W 82Ω ±5%	1	1	1	1		
R171	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R172	RME0861	R,Metal,Chip 1/8W 56Ω ±5%	1	1	1	1		
R173	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R174	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R175	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R176	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R177	RME0861	R,Metal,Chip 1/8W 56Ω ±5%	1	1	1	1		
R178	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R191	RME0861	R,Metal,Chip 1/8W 56Ω ±5%	1	1	1	1		
R192	RME0863	R,Metal,Chip 1/8W 82Ω ±5%	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
R193	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R194	RCE0770	R,Carbon 1/4W 1.2kΩ ±5%	1	1	1	1		
R195	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R196	RME0883	R,Metal,Chip 1/8W 3.9kΩ ±5%	1	1	1	1		
R303	RMS0049	R,Metal 1/2W 1MΩ ±0.5%	1	1	1	1		
R304	RME0874	R,Metal,Chip 1/8W 680Ω ±5%	1	1	1	1		
R305	RME0861	R,Metal,Chip 1/8W 56Ω ±5%	1	1	1	1		
R306	RME0861	R,Metal,Chip 1/8W 56Ω ±5%	1	1	1	1		
R307	RME0870	R,Metal,Chip 1/8W 330Ω ±5%	1	1	1	1		
R310	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R312	RMS0043	R,Metal 1/4W 900kΩ ±0.5%	1	1	1	1		
R313	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R314	RME0875	R,Metal,Chip 1/8W 820Ω ±5%	1	1	1	1		
R315	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R319	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R320	RME0906	R,Metal,Chip 1/8W 1.0MΩ ±5%	1	1	1	1		
R321	RME0867	R,Metal,Chip 1/8W 180Ω ±5%	1	1	1	1		
R322	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R323	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R325	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R326	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R328	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R329	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R331	RME0856	R,Metal,Chip 1/8W 22Ω ±5%	1	1	1	1		
R332	RME0877	R,Metal,Chip 1/8W 1.2kΩ ±5%	1	1	1	1		
R333	RME0906	R,Metal,Chip 1/8W 1.0MΩ ±5%	1	1	1	1		
R334	RME0886	R,Metal,Chip 1/8W 6.8kΩ ±5%	1	1	1	1		
R335	RME0906	R,Metal,Chip 1/8W 1.0MΩ ±5%	1	1	1	1		
R336	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R340	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
R341	RME0891	R,Metal,Chip 1/8W 18kΩ ±5%	1	1	1	1		
R342	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R350	RME1664	R,Metal 1/4W 600kΩ ±0.5%	1	1	1	1		
R352	RME1163	R,Metal 1/4W 111kΩ ±0.5%	1	1	1	1		
R360	RME1072	R,Metal 1/4W1.00kΩ ±1%	1	1	1	1		
R361	RME0877	R,Metal,Chip 1/8W 1.2kΩ ±5%	1	1	1	1		
R362	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R363	RME1094	R,Metal 1/4W68.1kΩ ±1%	1	1	1	1		
R364	RME1075	R,Metal 1/4W1.82kΩ ±1%	1	1	1	1		
R366	RCE0769	R,Carbon 1/4W 1kΩ ±5%	1	1	1	1		
R367	RME1060	R,Metal 1/4W 100Ω ±1%	1	1	1	1		
R368	RME1060	R,Metal 1/4W 100Ω ±1%	1	1	1	1		
R369	RCE0757	R,Carbon 1/4W 100Ω ±5%	1	1	1	1		
R370	RME0870	R,Metal,Chip 1/8W 330Ω ±5%	1	1	1	1		
R401	RME0883	R,Metal,Chip 1/8W 3.9kΩ ±5%	1	1	1	1		
R402	RME0887	R,Metal,Chip 1/8W 8.2kΩ ±5%	1	1	1	1		
R403	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R404	RME1065	R,Metal 1/4W 267Ω ±1%	1	1	1	1		
R405	RME0883	R,Metal,Chip 1/8W 3.9kΩ ±5%	1	1	1	1		
R406	RME0887	R,Metal,Chip 1/8W 8.2kΩ ±5%	1	1	1	1		
R407	RCE0773	R,Carbon 1/4W 2.2kΩ ±5%	1	1	1	1		
R409	RME1193	R,Metal 1/4W11.0kΩ ±1%	1	1	1	1		
R410	RME1077	R,Metal 1/4W2.67kΩ ±1%	1	1	1	1		
R414	RME0896	R,Metal,Chip 1/8W 47kΩ ±5%	1	1	1	1		
R415	RME0896	R,Metal,Chip 1/8W 47kΩ ±5%	1	1	1	1		
R470	RME1068	R,Metal 1/4W 475Ω ±1%	1	1	1	1		
R471	RME1068	R,Metal 1/4W 475Ω ±1%	1	1	1	1		
R472	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R473	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R475	RME1064	R,Metal 1/4W 221Ω ±1%	1	1	1	1		
R476	RME1223	R,Metal 1/4W 432Ω ±1%	1	1	1	1		
R477	RME1064	R,Metal 1/4W 221Ω ±1%	1	1	1	1		
R478	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E
R479	RME0870	R,Metal,Chip 1/8W 330Ω ±5%	1	1	1	1	
R480	RCE0767	R,Carbon 1/4W 680Ω ±5%	1	1	1	1	
R481	RME0877	R,Metal 1/4W 1.2kΩ ±5%	1	1	1	1	
R482	RME0877	R,Metal,Chip 1/8W 1.2kΩ ±5%	1	1	1	1	
R483	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1	
R484	RME0897	R,Metal,Chip 1/8W 56kΩ ±5%	1	1	1	1	
R485	RCE0757	R,Carbon 1/4W 100kΩ ±5%	1	1	1	1	
R486	RME1071	R,Metal 1/4W 825Ω ±1%	1	1	1	1	
R487	RME1071	R,Metal 1/4W 825Ω ±1%	1	1	1	1	
R488	RME1106	R,Metal 1/4W 75.0Ω ±1%	1	1	1	1	
R489	RME1106	R,Metal 1/4W 75.0Ω ±1%	1	1	1	1	
R490	RCE0768	R,Carbon 1/4W 820Ω ±5%	1	1	1	1	
R491	RME0862	R,Metal,Chip 1/8W 68Ω ±5%			1	1	
R492	RME0863	R,Metal,Chip 1/8W 82Ω ±5%			1	1	
R492	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1			
R493	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1	
R601	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1	
R602	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1	
R603	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1	
R604	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1	
R605	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1	
R606	RME0878	R,Metal,Chip 1/8W 1.5kΩ ±5%	1	1	1	1	
R607	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1	
R608	RME0903	R,Metal,Chip 1/8W 330kΩ ±5%	1	1	1	1	
R610	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1	
R611	RME0867	R,Metal,Chip 1/8W 180Ω ±5%	1	1	1	1	
R612	RME1072	R,Metal 1/4W1.00kΩ ±1%	1	1	1	1	
R613	RME1072	R,Metal 1/4W1.00kΩ ±1%	1	1	1	1	
R614	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1	
R615	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1	
R616	RME0874	R,Metal,Chip 1/8W 680Ω ±5%	1	1	1	1	
R617	RME0874	R,Metal,Chip 1/8W 680Ω ±5%	1	1	1	1	
R618	RME0863	R,Metal,Chip 1/8W 82Ω ±5%	1	1	1	1	
R619	RME0863	R,Metal,Chip 1/8W 82Ω ±5%	1	1	1	1	
R620	RME0891	R,Metal,Chip 1/8W 18kΩ ±5%	1	1	1	1	
R621	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1	
R622	RME0904	R,Metal,Chip 1/8W 470kΩ ±5%	1	1	1	1	
R623	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1	
R624	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1	
R625	RME0891	R,Metal,Chip 1/8W 18kΩ ±5%	1	1	1	1	
R626	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1	
R627	RME0904	R,Metal,Chip 1/8W 470kΩ ±5%	1	1	1	1	
RM52	3203299	R,Network FOR 2ND ATT	1	1	1	1	
RM152	3203299	R,Network FOR 2ND ATT	1	1	1	1	
RV30	RNE0051	VR,Metal EVN 39C00YB14(10k)	1	1	1	1	
RV37	RNE0047	VR,Metal EVN 39C00YB54(50k)	1	1	1	1	
RV62	RNE0047	VR,Metal EVN 39C00YB54(50k)	1	1	1	1	
RV130	RNE0051	VR,Metal EVN 39C00YB14(10k)	1	1	1	1	
RV133	RNE0048	VR,Metal EVN 39C00YB22(200)	1	1	1	1	
RV137	RNE0047	VR,Metal EVN 39C00YB54(50k)	1	1	1	1	
RV162	RNE0047	VR,Metal EVN 39C00YB54(50k)	1	1	1	1	
RV320	RNE0047	VR,Metal EVN 39C00YB54(50k)	1	1	1	1	
S1	SSP0574	SW,Push SPU-1	1	1	1	1	
S2	8472813A	SW,Rotary ADR255S18R11PY01 (w/o S5)	1		1		
S2	8472813B	SW,Rotary ADR255S18R11PY02 (w. S5)		1		1	
S11	SSP0574	SW,Push SPUJ-1	1	1	1	1	
S101	SSP0574	SW,Push SPUJ-1	1	1	1	1	
S102	8472813A	SW,Rotary ADR255S18R11PY01 (w/o S5)	1		1		
S102	8472813B	SW,Rotary ADR255S18R11PY02 (w. S5)		1		1	
S111	SSP0574	SW,Push SPUJ-1	1	1	1	1	

A:V-660, B:V-665
C:V-1060, D:V-1065

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
S301	SSR0311	SW,Rotary SRRZS4	1	1	1	1		
TR25	HTK0127	Transistor,Chip 2SK508 K52	1	1	1	1		
TR28	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR40	HTA0334	Transistor,Chip 2SA1226E4	1	1				
TR40	HTA0318	Transistor,Chip 2SA1462Y34			1	1		
TR41	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR42	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR57	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR58	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR71	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR72	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR93	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR125	HTK0127	Transistor,Chip 2SK508 K52	1	1	1	1		
TR128	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR140	HTA0334	Transistor,Chip 2SA1226E4	1	1				
TR140	HTA0318	Transistor,Chip 2SA1462Y34			1	1		
TR141	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR142	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR157	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR158	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR171	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR172	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR175	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR176	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR193	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR320	HTK0127	Transistor,Chip 2SK508 K52	1	1	1	1		
TR325	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR330	HTC0871	Transistor,Chip 2SC3772LY4	1	1	1	1		
TR362	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR363	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR365	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR401	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR402	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR407	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR475	HTA0334	Transistor,Chip 2SA1226E4	1	1				
TR475	HTA0344	Transistor,Chip 2SA1245			1	1		
TR476	HTA0318	Transistor,Chip 2SA1462Y34	1	1				
TR476	HTA0344	Transistor,Chip 2SA1245			1	1		
TR484	HTA0318	Transistor,Chip 2SA1462Y34	1	1	1	1		
TR485	HTA0318	Transistor,Chip 2SA1462Y34	1	1	1	1		
TR601	HTA0318	Transistor,Chip 2SA1462Y34	1	1	1	1		
TR604	HTC0872	Transistor,Chip 2SC2620QC	1	1	1	1		
TR605	HTC0872	Transistor,Chip 2SC2620QC	1	1	1	1		
TR620	HTC0872	Transistor,Chip 2SC2620QC	1	1	1	1		
TR621	HTA0334	Transistor,Chip 2SA1226E4	1	1	1	1		
TR625	HTA0334	Transistor,Chip 2SA1226E4	1	1	1	1		
TR626	HTC0872	Transistor,Chip 2SC2620QC	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
6	ETP0141	Pin DP-2	1	1	1	1		
7	ETP0141	Pin DP-2	1	1	1	1		
16	ETO0141	Pin DP-2	1	1	1	1		
17	ETP0141	Pin DP-2	1	1	1	1		
12	ETP0141	Pin DP-2	1	1	1	1		
14	ETP0141	Pin DP-2	1	1	1	1		
C630	CES0252	C,Al Elyc 16V 10μF ±20% BP	1	1	1	1		
C632	CES0378	C,Al Elyc 16V 330μF ±20%	1	1	1	1		
C634	CCG0209	C,Ceramic,Chip 50V 4700pF ±10%	1	1	1	1		
C640	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C643	CCG0143	C,Ceramic,Chip 50V 100pF ±5%	1	1	1	1		
C650	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C651	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C657	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C660	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C661	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C664	CQA0129	C,Plastic 50V 0.022μF ±10%	1	1	1	1		
C669	CCG0141	C,Ceramic,Chip 50V 68pF ±5%	1	1	1	1		
C672	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C674	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C682	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C684	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C710	CMV0053	C,Plastic 50V 180pF ±5%	1	1	1	1		
C710A	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C711	CCG0130	C,Ceramic,Chip 50V 18pF ±5%	1	1	1	1		
C712	CCG0132	C,Ceramic,Chip 50V 22pF ±5%	1	1	1	1		
C714	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C715	CQE0049	C,Plastic 100V 1μF ±5%	1	1	1	1		
C717	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C718	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C772	CCG0132	C,Ceramic,Chip 50V 22pF ±5%	1	1	1	1		
C722A	CCG0124	C,Ceramic,Chip 50V 10pF ±0.5pF	1	1	1	1		
C733	CCG0144	C,Ceramic,Chip 50V 220pF ±5%	1	1	1	1		
C734	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C735	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C801	CES0378	C,Al Elyc 16V 330μF ±20%	1	1	1	1		
C802	CES0378	C,Al Elyc 16V 330μF ±20%	1	1	1	1		
C803	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C804	CCG0116	C,Ceramic,Chip 50V 2pF ±0.25pF	1	1	1	1		
C805	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C807	CES0131	C,Al Elyc 16V 10μF ±20%	1	1	1	1		
C813	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C815	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C818	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C821	CCG0116	C,Ceramic,Chip 50V 2pF ±0.25pF	1	1	1	1		
C822	CCG0116	C,Ceramic,Chip 50V 2pF ±0.25pF	1	1	1	1		
C825	CET0033	C,Al Elyc 160V 1μF ±20%	1	1	1	1		
C826	CCG0176	C,Ceramic,Chip 50V 1pF ±0.25pF	1	1	1	1		
C843	CCG0143	C,Ceramic,Chip 50V 100pF ±5%	1	1	1	1		
C861	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C862	CET0033	C,Al Elyc 160V 1μF ±20%	1	1	1	1		
C872	CCG0199	C,Ceramic,Chip 50V 330pF ±5%	1	1	1	1		
C877	CCG0205	C,Ceramic,Chip 50V 1000pF ±10%	1	1	1	1		
C878	CES0134	C,Al Elyc 50V 1μF ±20%	1	1	1	1		
C1101	CCG0211	C,Ceramic,Chip 20V 10000pF ±10%	1	1	1	1		
C1102	CCG0124	C,Ceramic,Chip 50V 10pF ±0.5pF	1	1	1	1		
C1105	CCG0139	C,Ceramic,Chip 50V 47pF ±5%	1	1	1	1		
C1106	CCG0193	C,Ceramic,Chip 50V 150pF ±5%	1	1	1	1		
C1109	CCG0199	C,Ceramic,Chip 50V 330pF ±5%	1	1	1	1		
C1111	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		

PEF-782 SWP LOGIC

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
C1121	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C1124	CCG0296	C,Ceramic,Chip 50V 1000pF ±5%	1	1	1	1		
C1225	CCG0296	C,Ceramic,Chip 50V 1000pF ±5%	1	1	1	1		
C1226	CCG0199	C,Ceramic,Chip 50V 330pF ±5%	1	1	1	1		
C1127	CCG0296	C,Ceramic,Chip 50V 1000pF ±5%	1	1	1	1		
C2100	CQA0121	C,Plastic 50V 33000pF ±10%	1	1	1	1		
C2101	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C2107	CCE0211	C,Ceramic 50V 10000pF ±10%	1	1	1	1		
C2108	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C2110	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C2130	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2131	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2142	CCG0205	C,Ceramic,Chip 50V 1000pF ±10%	1	1	1	1		
C2143	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C2144	CCG0205	C,Ceramic,Chip 50V 1000pF ±10%	1	1	1	1		
C2144A	CCG0201	C,Ceramic,Chip 50V 470pF ±5%	1	1	1	1		
C2146	CCG0209	C,Ceramic,Chip 50V 4700pF ±10%	1	1	1	1		
C2150	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C2151	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C2153	CQE0062	C,Plastic 50V 1μF ±5%	1	1	1	1		
C2154	CQE0062	C,Plastic 50V 1μF ±5%	1	1	1	1		
C2155	CEK0186	C,Al Elyc 50V 4.7μF ±20%	1	1	1	1		
C2156	CCG0124	C,Ceramic,Chip 50V 10pF ±5%	1	1	1	1		
C2157	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2160	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2161	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2162	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2163	CCG0143	C,Ceramic,Chip 50V 100pF ±5%	1	1	1	1		
C2164	CCG0143	C,Ceramic,Chip 50V 100pF ±5%	1	1	1	1		
C2165	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2166	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2168	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C2170	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C2171	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2201	CES0033	C,Al Elyc 25V 100μF ±20%	1	1	1	1		
C2202	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C2210	CCG0296	C,Ceramic,Chip 50V 1000pF ±5%	1	1	1	1		
C2211	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2212	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2215	CCG0296	C,Ceramic,Chip 50V 1000pF ±5%	1	1	1	1		
C2220	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2221	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2230	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C2231	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C2247	CES0133	C,Al Elyc 16V 47μF ±20%	1	1	1	1		
C2248	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2249	CQA0124	C,Plastic 50V 0.1μF ±10%	1	1	1	1		
D630	HDM0140	Diode MTZ 4.7JB	1	1	1	1		
D631	HDX0055	Diode 1SS165	1	1	1	1		
D632	HDS0437	Diode 1SS133	1	1	1	1		
D633	HDS0437	Diode 1SS133	1	1	1	1		
D660	HDS0437	Diode 1SS133	1	1	1	1		
D661	HDS0437	Diode 1SS133	1	1	1	1		
D662	HDS0437	Diode 1SS133	1	1	1	1		
D663	HDS0437	Diode 1SS133	1	1	1	1		
D664	HDS0437	Diode 1SS133	1	1	1	1		
D665	HDS0437	Diode 1SS133	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E
D666	HDS0437	Diode 1SS133	1	1	1	1	
D668	HDS0437	Diode 1SS133	1	1	1	1	
D670	HDS0437	Diode 1SS133	1	1	1	1	
D675	HDS0437	Diode 1SS133	1	1	1	1	
D685	HDS0437	Diode 1SS133	1	1	1	1	
D692	HDS0437	Diode 1SS133	1	1	1	1	
D710	HDM0051	Diode MA161	1	1	1	1	
D711	HDS0576	Diode 1SS286	1	1	1	1	
D712	HDS0576	Diode 1SS286	1	1	1	1	
D723	HDS0437	Diode 1SS133	1	1	1	1	
D724	HDS0228	Diode HZ7A1	1	1	1	1	
D740	HDM0139	Diode MTZ 3.3JA	1	1	1	1	
D841	HDZ0055	Diode 1SS165	1	1	1	1	
D842	HDX0055	Diode 1SS165	1	1	1	1	
D867	HDM0141	Diode MTZ 7.5JC	1	1	1	1	
D1101	HDS0437	Diode 1SS133	1	1	1	1	
D1102	HDS0437	Diode 1SS133	1	1	1	1	
D1103	HDS0437	Diode 1SS133	1	1	1	1	
D1104	HDS0437	Diode 1SS133	1	1	1	1	
D1105	HDS0437	Diode 1SS133	1	1	1	1	
D1113	HDS0055	Diode 1SS165	1	1	1	1	
D1114	HDS0437	Diode 1SS133	1	1	1	1	
D1115	HDS0055	Diode 1SS165	1	1	1	1	
D1116	HDS0437	Diode 1SS133	1	1	1	1	
D2107	HDS0437	Diode 1SS133	1	1	1	1	
D2108	HDM0176	Diode MTZ6.8JC	1	1	1	1	
D2155	HDS0437	Diode 1SS133	1	1	1	1	
D2165	HDS0437	Diode 1SS133	1	1	1	1	
D2166	HDS0437	Diode 1SS133	1	1	1	1	
D2212	HDS0437	Diode 1SS133	1	1	1	1	
IC659	IDS0444	IC,Digital SN74AS00N	1	1	1	1	
IC660	IDS0455	IC,Digital SN74AS74N	1	1	1	1	
IC661	IDH0982	IC,Digital HD74HC00P(TC74HC00P)	1	1	1	1	
IC670	ILM0431	IC,Analog M5201L	1	1	1	1	
IC680	ILM0431	IC,Analog M5201L	1	1	1	1	
IC694	HTD0160	Transistor,Chip DTA124S	1	1	1	1	
IC716	HTD0161	Transistor,Chip DTC124K	1	1	1	1	
IC717	IDM0706	IC,Digital MC74HC4053N	1	1	1	1	
IC730	ILN0042	IC,Analog NJM 072S	1	1	1	1	
IC738	HTD0161	Transistor,Chip DTC124K	1	1	1	1	
IC864	HTD0161	Transistor,Chip DTC124K	1	1	1	1	
IC1101	IDH0475	IC,Digital HD74LS10P	1	1	1	1	
IC1111	IDH0471	IC,Digital HD74LS04P	1	1	1	1	
IC1121	IDH0467	IC,Digital HD74LS00P	1	1	1	1	
IC2107	IDH0467	IC,Digital HD74LS00P	1	1	1	1	
IC2108	HTC0590	Transistor,Chip 2SC1621B4	1	1	1	1	
IC2109	HTC0590	Transistor,Chip 2SC1621B4	1	1	1	1	
IC2130	IDH0800	IC,Digital HD14051BP(MC14051BCP)	1	1	1	1	
IC2150	ILT0045	IC,Analog TL064CN	1	1	1	1	
IC2160	IDH0586	IC,Digital HD74LS4AP	1	1	1	1	
IC2161	IDT0096	IC,Digital TC40H151P	1	1	1	1	
IC2162	IDH0467	IC,Digital HD74LS00P	1	1	1	1	
IC2165	IDS0479	IC,Digital SN74LS594N	1	1	1	1	
IC2166	IDT0049	IC,Digital TC40H164P	1	1	1	1	
IC2170	IDS0455	IC,Digital SN74AS74N	1	1	1	1	
IC2171	IDH0914	IC,Digital HD74LS393P	1	1	1	1	
IC2201	ILT0091	IC,Analog TL431CLP-B	1	1	1	1	
IC2211	IDT0047	IC,Digital TC40H002P	1	1	1	1	
IC2212	IDH0795	IC,Digital HD14040BP(MC14040BCP)	1	1	1	1	
IC2220	IDM0704	IC,Digital MC74HC4052N	1	1	1	1	
IC2230	ILN0042	IC,Analog MJM072S	1	1	1	1	
IC2230A	ILN0042	IC,Analog NJM072S	1	1	1	1	

A:V-660, B:V-665
C:V-1060, D:V-1065

MBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
2248	IDT0039	IC,Digital TC40H000P	1	1	1	1		
43	TLE0084	Coil EL0606SKI 1ROM	1	1	1	1		
45	TLN0005	Coil 0.22μH 450mA ±20%	1	1	1	1		
01	TLE0172	Coil EL0607SKI 470K (47μH)	1	1	1	1		
02	TLE0172	Coil EL0607SKI 470K (47μH)	1	1	1	1		
63	TLE0058	Coil EL0606SKI 100K (10μH)	1	1	1	1		
64	TLE0058	Coil EL0606SKI 100K (10μH)	1	1	1	1		
70	TLN0006	Coil NL3225224R7M (4.7μH)	1	1	1	1		
03	JBB0076	Connector B10P-SHF-GB	1	1	1	1		
04	JBB0031	Connector B8P-SHF-GB	1	1	1	1		
15	JBB0022	Connector B6B-XH-A	1	1	1	1		
17	JBB0027	Connector B2B-XH-A		1		1		
18	JBB0027	Connector B2B-XH-A		1		1		
01	JBB0024	Connector B15B-XH-A	1	1	1	1		
02	JBB0026	Connector B10B-XH-A	1	1	1	1		
03	JBB0026	Connector B10B-XH-A	1	1	1	1		
04	JBB0022	Connector B6B-XH-A	1	1	1	1		
05	JBB0021	Connector B3B-XH-A	1	1	1	1		
10	JBB0024	Connector B15B-XH-A	1	1	1	1		
11	JBB0060	Connector B5B-XH-A	1	1	1	1		
01	JBB0031	Connector B8P-SHF-GB	1	1	1	1		
02	JBB0031	Connector B8P-SHF-GB	1	1	1	1		
03	JBB0031	Connector B8P-SHF-GB	1	1	1	1		
04	JBB0031	Connector B8P-SHF-GB	1	1	1	1		
05	JBB0031	Connector B8P-SHF-GB	1	1	1	1		
06	JBB0031	Connector B8P-SHF-GB	1	1	1	1		
07	JBB0031	Connector B8P-SHF-GB	1	1	1	1		
08	JBB0031	Connector B8P-SHF-GB	1	1	1	1		
30	RME0869	R,Metal,Chip 1/8W 270Ω ±5%	1	1	1	1		
31	RME0894	R,Metal,Chip 1/8W 33kΩ ±5%	1	1	1	1		
32	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
33	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
34	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
35	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
36	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
37	RME0885	R,Metal,Chip 1/8W 5.6kΩ ±5%	1	1	1	1		
38	RME0895	R,Metal,Chip 1/8W 39kΩ ±5%	1	1	1	1		
39	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
40	RME0865	R,Metal,Chip 1/8W 120Ω ±5%	1	1	1	1		
41	RME0865	R,Metal,Chip 1/8W 120Ω ±5%	1	1	1	1		
43	RME1191	R,Metal 1/4W 432Ω ±1%	1	1	1	1		
50	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
51	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
53	RME0856	R,Metal,Chip 1/8W 22Ω ±5%	1	1	1	1		
55	RME0865	R,Metal,Chip 1/8W 120Ω ±5%	1	1	1	1		
56	RME0878	R,Metal,Chip 1/8W 1.5kΩ ±5%	1	1	1	1		
57	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
60	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
61	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
61A	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
61B	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
62	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
63	RME0896	R,Metal,Chip 1/8W 47kΩ ±5%	1	1	1	1		
64	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
65	RME0881	R,Metal,Chip 1/8W 2.7kΩ ±5%	1	1	1	1		
66	RME0878	R,Metal,Chip 1/8W 1.5kΩ ±5%	1	1	1	1		
67	RME1715	R,Metal,Chip 1/8W 4.7MΩ ±10%	1	1	1	1		
68	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
69	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
69A	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
R670	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R671	RME0894	R,Metal,Chip 1/8W 33kΩ ±5%	1	1	1	1		
R672	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R673	RME0890	R,Metal,Chip 1/8W 15kΩ ±5%	1	1	1	1		
R674	RME0901	R,Metal,Chip 1/8W 150kΩ ±5%	1	1	1	1		
R675	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R676	RME0868	R,Metal,Chip 1/8W 220Ω ±5%	1	1	1	1		
R681	RME0894	R,Metal,Chip 1/8W 33kΩ ±5%	1	1	1	1		
R682	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R683	RME0890	R,Metal,Chip 1/8W 15kΩ ±5%	1	1	1	1		
R684	RME0901	R,Metal,Chip 1/8W 150kΩ ±5%	1	1	1	1		
R685	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R686	RME0868	R,Metal,Chip 1/8W 220Ω ±5%	1	1	1	1		
R691	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R692	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R693	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R700	RME0856	R,Metal,Chip 1/8W 22Ω ±5%	1	1	1	1		
R701	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R703	RME0874	R,Metal,Chip 1/8W 680Ω ±5%	1	1	1	1		
R703A	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R704	RME0869	R,Metal,Chip 1/8W 270Ω ±5%	1	1	1	1		
R705	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R706	RME0890	R,Metal,Chip 1/8W 15kΩ ±5%	1	1	1	1		
R707	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R708	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R709	RME0886	R,Metal,Chip 1/8W 6.8kΩ ±5%	1	1	1	1		
R710	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R710A	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R711	RME0886	R,Metal,Chip 1/8w 6.8kΩ ±5%	1	1	1	1		
R712	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R713	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R713A	RME0888	R,Metal,Chip 1/8w 10kΩ ±5%	1	1	1	1		
R714	RME0858	R,Metal,Chip 1/8W 33Ω ±5%	1	1	1	1		
R715	RCE0704	R,Carbon 1/2W 820Ω ±5%	1	1	1	1		
R716	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R716A	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R717	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R718	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R719	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R720	RME1080	R,Metal 1/4W 4.75kΩ ±1%	1	1	1	1		
R721	RME1080	R,Metal 1/4W 4.75kΩ ±1%	1	1	1	1		
R722	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R722A	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R723	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R723A	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R724	RME0878	R,Metal,Chip 1/8W 1.5kΩ ±5%	1	1	1	1		
R725	RME0898	R,Metal,Chip 1/8W 68kΩ ±5%	1	1	1	1		
R732	RME1078	R,Metal 1/4W 3.32kΩ ±1%	1	1	1	1		
R733	RME1174	R,Metal 1/4W 2.00kΩ ±1%	1	1	1	1		
R734	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R735	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R736	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R737	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R738	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R738A	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R740	RME1710	R,Metal 1/4W 1.0MΩ ±0.5%	1	1	1	1		
R740A	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R741	RME1163	R,Metal 1/4W 1.11kΩ ±0.5%	1	1	1	1		
R742	RME0887	R,Metal,Chip 1/8W 8.2kΩ ±5%	1	1	1	1		
R743	RME1156	R,Metal 1/4w 10.1kΩ ±0.5%	1	1	1	1		
R744	RME0887	R,Metal,Chip 1/8W 8.2kΩ ±5%	1	1	1	1		
R745	RME1711	R,Metal 1/4W 1.00kΩ ±0.5%	1	1	1	1		
R746	RME0887	R,Metal,Chip 1/8W 8.2kΩ ±5%	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
R750	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R751	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R752	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R801	RCE774	R,Carbon 1/4W 3.3kΩ ±5%	1	1	1	1		
R801A	RME0865	R,Metal,Chip 1/8W 120Ω ±5%	1	1	1	1		
R802	RME0863	R,Metal,Chip 1/8W 82Ω ±5%	1	1	1	1		
R803	RME1412	R,Metal 1/4W 4.32kΩ ±1%	1	1	1	1		
R804	RME1412	R,Metal 1/4W 4.32kΩ ±1%	1	1	1	1		
R805	RME1073	R,Metal 1/4W 1.21kΩ ±1%	1	1	1	1		
R806	RME1070	R,Metal 1/4W 681Ω ±1%	1	1	1	1		
R807	RME0890	R,Metal,Chip 1/8W 15kΩ ±5%	1	1	1	1		
R808	RME0889	R,Metal,Chip 1/8W 12kΩ ±5%	1	1	1	1		
R811	RME1058	R,Metal 1/4W 68.1Ω ±1%	1	1	1	1		
R812	RME1123	R,Metal 1/4W 2.43kΩ ±1%	1	1	1	1		
R813	RME1072	R,Metal 1/4W 1.00kΩ ±1%	1	1	1	1		
R815	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R816	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R817	RME0883	R,Metal,Chip 1/8W 3.9kΩ ±5%	1	1	1	1		
R818	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R821	RME1074	R,Metal 1/4W 1.50kΩ ±1%	1	1	1	1		
R822	RME1074	R,Metal 1/4W 1.50kΩ ±1%	1	1	1	1		
R823	RCE0779	R,Carbon 1/4W 6.8kΩ ±5%	1	1	1	1		
R824	RCE0779	R,Carbon 1/4W 6.8kΩ ±5%	1	1	1	1		
R825	RCE0772	R,Carbon 1/4W 1.8kΩ ±5%	1	1	1	1		
R826	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R831	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R832	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R834	RME0883	R,Metal,Chip 1/8W 3.9kΩ ±5%	1	1	1	1		
R836	RME0896	R,Metal,Chip 1/8W 47kΩ ±5%	1	1	1	1		
R838	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R839	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R841	RME1071	R,Metal 1/4W 825Ω ±1%	1	1	1	1		
R842	RME1071	R,Metal 1/4W 825Ω ±1%	1	1	1	1		
R843	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R844	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R846	RME0896	R,Metal,Chip 1/8W 47kΩ ±5%	1	1	1	1		
R847	RME0868	R,Metal,Chip 1/8W 220Ω ±5%	1	1	1	1		
R852	RME1078	R,Metal 1/4W 3.32kΩ ±1%	1	1	1	1		
R853	RME1078	R,Metal 1/4W 3.32kΩ ±1%	1	1	1	1		
R861	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1		
R862	RME1081	R,Metal 1/4W 5.62kΩ ±1%	1	1	1	1		
R863	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R864	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R865	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R866	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R867	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R868	RME0879	R,Metal,Chip 1/8W 1.8kΩ ±5%	1	1	1	1		
R871	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R875	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R876	RME0885	R,Metal,Chip 1/8W 5.6kΩ ±5%	1	1	1	1		
R877	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R881	RME1070	R,Metal 1/4W 681Ω ±1%	1	1	1	1		
R882	RME1070	R,Metal 1/4W 681Ω ±1%	1	1	1	1		
R884	RME0881	R,Metal,Chip 1/8W 2.7kΩ ±5%	1	1	1	1		
R885	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R886	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R887	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R1101	RME0875	R,Metal,Chip 1/8W 820Ω ±5%	1	1	1	1		
R1102	RME0896	R,Metal,Chip 1/8W 47kΩ ±5%	1	1	1	1		
R1103	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R1104	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R1105	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
R1106	RME0890	R,Metal,Chip 1/8W 15kΩ ±5%	1	1	1	1		
R1109	RME0879	R,Metal,Chip 1/8W 1.8kΩ ±5%	1	1	1	1		
R1112	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R1113	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R1114	RME0883	R,Metal,Chip 1/8W 3.9kΩ ±5%	1	1	1	1		
R1115	RME0886	R,Metal,Chip 1/8W 6.8kΩ ±5%	1	1	1	1		
R1116	RME0890	R,Metal,Chip 1/8W 15kΩ ±5%	1	1	1	1		
R1121	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
R1122	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
R1123	RME0878	R,Metal,Chip 1/8W 1.5kΩ ±5%	1	1	1	1		
R1124	RME0885	R,Metal,Chip 1/8W 5.6kΩ ±5%	1	1	1	1		
R1125	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R1126	RME0868	R,Metal,Chip 1/8W 220Ω ±5%	1	1	1	1		
R1127	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R2100	RCE0738	R,Carbon 1/2W 2.2MΩ ±5%	1	1	1	1		
R2105	RME0900	R,Metal,Chip 1/8W 100kΩ ±5%	1	1	1	1		
R2106	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R2107	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R2108	RME0896	R,Metal,Chip 1/8W 47kΩ ±5%	1	1	1	1		
R2109	RME0896	R,Metal,Chip 1/8W 47kΩ ±5%	1	1	1	1		
R2111	RME1125	R,Metal 1/4W 5.11kΩ ±1%	1	1	1	1		
R2112	RME1082	R,Metal 1/4W 6.81kΩ ±1%	1	1	1	1		
R2113	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1		1			
R2114	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1		1			
R2115	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R2116	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R2117	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R2118	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R2119	RME0902	R,Metal,Chip 1/8W 220kΩ ±5%	1	1	1	1		
R2120	RME0902	R,Metal,Chip 1/8W 220kΩ ±5%	1	1	1	1		
R2130	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R2131	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R2132	RME0874	R,Metal,Chip 1/8W 680Ω ±5%	1	1	1	1		
R2142	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R2146	RME0868	R,Metal,Chip 1/8W 220Ω ±5%	1	1	1	1		
R2150	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R2151	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R2155	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R2156	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R2157	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
R2161	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R2163	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R2164	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R2165	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R2166	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R2167	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R2168	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R2169	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R2171	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
R2173	RME0912	R,Metal,Chip 0Ω			1	1		
R2174	RME0912	R,Metal,Chip 0Ω	1	1				
R2176	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
R2177	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R2178	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R2201	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R2202	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
R2203	RME0858	R,Metal,Chip 1/8W 33Ω ±5%	1	1	1	1		
R2204	RME1084	R,Metal 1/4W 10.0kΩ ±1%	1	1	1	1		
R2205	RME1084	R,Metal 1/4W 10.0kΩ ±1%	1	1	1	1		
R2210	RME1229	R,Metal,Chip 1/8W 820kΩ ±5%	1	1	1	1		
R2211A	RME1207	R,Metal 1/4W 75.0kΩ ±1%	1	1	1	1		
R2212	RME0879	R,Metal,Chip 1/8W 1.8kΩ ±5%	1	1	1	1		
R2213	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		

A:V-660, B:V-665
C:V-1060, D:V-1065

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
R2220	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R2221	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R2222	RME0874	R,Metal,Chip 1/8W 680Ω ±5%	1	1	1	1		
R2225	RME1069	R,Metal 1/4W 562Ω ±1%	1	1	1	1		
R2225A	RME1121	R,Metal 1/4W 1.37kΩ ±1%	1	1	1	1		
R2226	RME1123	R,Metal 1/4W 2.43kΩ ±1%	1	1	1	1		
R2226A	RME1371	R,Metal 1/4W 1.65kΩ ±1%	1	1	1	1		
R2229	RME1088	R,Metal 1/4W 22.1kΩ ±1%	1	1	1	1		
R2230	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R2231	RME0852	R,Metal,Chip 1/8W 10Ω ±5%	1	1	1	1		
R2232	RME0866	R,Metal,Chip 1/8W 150Ω ±5%	1	1	1	1		
R2235A	RCE0766	R,Carbon 1/4W 560Ω ±5%	1	1	1	1		
R2236A	RCE0773	R,Carbon 1/4W 2.2kΩ ±5%	1	1	1	1		
R2243	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R2244	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R2245	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R2246	RME1155	R,Metal 1/4W 4.00kΩ ±0.5%	1	1	1	1		
R2247	RME1711	R,Metal 1/4W 1.00kΩ ±0.5%	1	1	1	1		
R2249	RCE0757	R,Carbon 1/4W 100Ω ±5%	1	1	1	1		
RM2120	RZA0166	R,Block EXB-LD10-503G	1	1	1	1		
RM2211	RCE0852	R,Block EXB-LD8-503G	1	1	1	1		
RM2231	RCE0852	R,Block EXB-LD8-503G	1	1	1	1		
RM2232	RCE0854	R,Block EXB-LD4-503G	1	1	1	1		
RT847	HDD0086	Thermistor 32D27	1	1	1	1		
RV675	RNE0047	VR,Metal EVN 39C00YB54(50k)	1	1	1	1		
RV685	RNE0047	VR,Metal EVN 39C00YB54(50k)	1	1	1	1		
RV801	RNE0058	VR,Metal EVN 39C00YB13(1k)	1	1	1	1		
RV807	RNE0051	VR,Metal EVN 39C00YB14(10k)	1	1	1	1		
RV831	RNE0048	VR,Metal EVN 39C00YB22(200)	1	1	1	1		
RV834	RNE0070	VR,Metal EVN 39C00YB53(5k)	1	1	1	1		
RV844	RNE0049	VR,Metal EVN 39C00YB12(100)	1	1	1	1		
RV876	RNE0051	VR,Metal EVN 39C00YB14(10k)	1	1	1	1		
RV884	RNE0070	VR,Metal EVN 39C00YB53(5k)	1	1	1	1		
S690	SSR0312	SW,Rotary SRBM 1024(N)	1	1	1	1		
TR632	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		
TR634	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR636	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR650	HTA0318	Transistor,Chip 2SA1462Y34	1	1	1	1		
TR651	HTA0318	Transistor,Chip 2SA1462Y34	1	1	1	1		
TR652	HTA0318	Transistor,Chip 2SA1462Y34	1	1	1	1		
TR653	HTA0318	Transistor,Chip 2SA1462Y34	1	1	1	1		
TR660	HTC0590	Transistor,Chip 2SC1621B4	1	1	1	1		
TR661	HTA0263	Transistor,Chip 2SA1621B4	1	1	1	1		
TR708	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		
TR709	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR710	HTK0147	Transistor,Chip 2SK436A20	1	1	1	1		
TR712	HTC0872	Transistor,Chip 2SC2620QC	1	1	1	1		
TR714	HTC0338	Transistor 2SC1906	1	1	1	1		
TR723	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR732	HTC0813	Transistor 2SC2853E	1	1	1	1		
TR734	HTA0336	Transistor 2SA1188E	1	1	1	1		
TR741	HTD0202	Transistor,Chip 2SD596DV3	1	1	1	1		
TR743	HTD0202	Transistor,Chip 2SD596DV3	1	1	1	1		
TR745	HTD0202	Transistor,Chip 2SD596DV3	1	1	1	1		
TR750	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		
TR751	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		
TR752	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		
TR811	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR812	HTA0334	Transistor,Chip 2SA1226E4	1	1	1	1		
TR821	HTC0691	Transistor,Chip 2SC2735JC	1	1	1	1		
TR822	HTC0691	Transistor,Chip 2SC2735JC	1	1	1	1		
TR831	HTA0334	Transistor,Chip 2SA1226E4	1	1	1	1		
TR832	HTA0334	Transistor,Chip 2SA1226E4	1	1	1	1		
TR863	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		
TR865	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		
TR867	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		
TR881	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		
TR882	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		
TR2201	HTC0781	Transistor 2SC3068	1	1	1	1		

PEF-783 PANEL

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
C1601	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C1602	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C1604	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C1605	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
D1601	HDP0033	Diode PG5534SY	1	1	1	1		
D1602	8392133-4	Diode GL-9PR2	1	1	1	1		
D1605	8392133-4	Diode GL-9PR2	1	1	1	1		
D1606	8392133-4	Diode GL-9PR2	1	1	1	1		
D1607	8392133-4	Diode GL-9PR2	1	1	1	1		
D1608	8392133-4	Diode GL-9PR2	1	1	1	1		
D1609	8392133-4	Diode GL-9PR2	1	1	1	1		
D1610	8392133-4	Diode GL-9PR2	1	1	1	1		
D1611	8392133-4	Diode GL-9PR2		1		1		
IC1601	IDH0651	IC,Digital HD74LS164P	1	1	1	1		
IC1602	IDH0651	IC,Digital HD74LS164P	1	1	1	1		
R1601	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1		
R1602	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1		
R1605	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1		
R1606	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1		
R1607	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1		
R1608	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1		
R1609	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1		
R1610	RME0873	R,Metal,Chip 1/8W 560Ω ±5%	1	1	1	1		
R1611	RME0873	R,Metal,Chip 1/8W 560Ω ±5%		1		1		
R1612	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R1620	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R1621	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R1622	RME0868	R,Metal,Chip 1/8W 220Ω ±5%			1	1		
R1622	RME0912	R,Metal,Chip 0Ω	1	1				
R1623	RME0898	R,Metal,Chip 1/8W 68kΩ ±5%	1	1	1	1		
R1631	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R1632	RME1060	R,Metal 1/4W 100Ω ±1%	1	1	1	1		
R1633	RME1060	R,Metal 1/4W 100Ω ±1%	1	1	1	1		
R1634	RME1109	R,Metal 1/4W 200Ω ±1%	1	1	1	1		
R1635	RME1154	R,Metal 1/4W 600Ω ±0.5%	1	1	1	1		
RM1601	RZA0202	R,Block EXB-LE5-502S	1	1	1	1		
RM1602	RZA0202	R,Block EXB-LE5-502S	1	1	1	1		
RM1603	RZA0202	R,Block EXB-LE5-502S	1	1	1	1		
RV1601	RDV0546	VR,Carbon V12L5(PVB)N10kΩSHAFT18	1	1	1	1		
RV1602	RNR0209	VR,Metal 1/2W 10kΩ ±25%	1	1	1	1		
RV1603	RDV0545	VR,Carbon V12L5(PVB)N 1kΩSHAFT18	1	1	1	1		
RV1604	RDV0546	VR,Carbon V12L5(PVB)N10kΩSHAFT18	1	1	1	1		
RV1605	RDV0546	VR,Carbon V12L5(PVB)N10kΩSHAFT18	1	1	1	1		
RV1606	RNR0210	VR,Metal 1/2W 4.7Ω ±25%	1	1	1	1		
RV1607	RDV0546	VR,Carbon V12L5(PVB)N10kΩSHAFT18	1	1	1	1		
RV2400	RNR0211	VR,Metal RK163 1210AG5B(10k)	1	1	1	1		
S1601	SSP0572	SW,Push SPPH2 TYPE-A NONLOCK	1	1	1	1		
S1602	SSP0572	SW,Push SPPH2 TYPE-A NONLOCK	1	1	1	1		
S1603	SSL0076	SW,Lever AL2S-2M(WITH NOBAZ4004)	1	1	1	1		
S1605	SSP0570	SW,Push SPPH1 TYPE-A SELFLOCK		1		1		
S1606	SSP0573	SW,Push SPUV30(STROKE1.5MM,RESET)	1	1	1	1		
S1607	SSP0571	SW,Push SPPH1 TYPE-A NONLOCK		1		1		
S1608	SSP0573	SW,Push SPUV30(STROKE1.5MM,RESET)	1	1	1	1		
S1609	SSP0571	SW,Push SPPH1 TYPE-A NONLOCK	1	1	1	1		
S1610	SSP0570	SW,Push SPPH1 TYPE-A SELFLOCK	1	1	1	1		
S1611	SSP0570	SW,Push SPPH1 TYPE-A SELFLOCK	1	1	1	1		
S1612	SSP0570	SW,Push SPPH1 TYPE-A SELFLOCK	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E
S1612	SSP0570	SW,Push SPPH1 TYPE-A SELFLOCK	1	1	1	1	

PEF-784 POWER

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E
	8480992	Sheet 35X 65 UL94V-1	1	1	1	1	
	8480993	Sheet 25X 25 UL94V-1	1	1	1	1	
	8488452	Sheet 25X 36 UL94V-1	1	1	1	1	
C850	CCC1030	C,Ceramic 50V 10000pF +80% -20%			1	1	
C850	CQA0124	C,Plastic 250V 0.1μF ±10%	1	1			
C855	CCC1002	C,Ceramic 50V 10pF ±5pF	1	1	1	1	
C856	CCC1002	C,Ceramic 50V 10pF ±5pF	1	1	1	1	
C857	CCD0273	C,Ceramic 500V 2pF ±0.25pF	1	1	1	1	
C858	CCD0273	C,Ceramic 500V 2pF ±0.25pF	1	1	1	1	
C862	CCC1030	C,Ceramic 50V 10000pF +80% -20%	1	1	1	1	
C863	CCC1030	C,Ceramic 50V 10000pF +80% -20%	1	1	1	1	
C871	CQA0037	C,Plastic 250V 0.01μF ±10%	1	1	1	1	
C872	CQA0037	C,Plastic 250V 0.01μF ±10%	1	1	1	1	
C883	CQA0037	C,Plastic 250V 0.01μF ±10%	1	1	1	1	
C884	CQA0037	C,Plastic 250V 0.01μF ±10%	1	1	1	1	
C885	CCC1026	C,Ceramic 50V 150pF ±10%	1	1	1	1	
C886	CCC1026	C,Ceramic 50V 150pF ±10%	1	1	1	1	
C901	CES0032	C,AL Elyc 25V 47μF ±20%	1	1	1	1	
C904	CCD0272	C,Ceramic 500V 1pF ±0.25pF	1	1	1	1	
C908	CCD0287	C,Ceramic 500V 4700pF +100% -0%	1	1	1	1	
C911	CCC1030	C,Ceramic 50V 10000pF +80% -20%	1	1	1	1	
C912	CEK0162	C,AL Elyc 160V 1μF ±20%	1	1	1	1	
C1004	CQA0139	C,Plastic 50V 0.068μF ±5%	1	1	1	1	
C1005	CEC0175	C,AL Elyc 25V 10μF ±20%	1	1	1	1	
C1010	CQA0099	C,Plastic 50V 22000pF ±10%	1	1	1	1	
C1011	CES0032	C,AL Elyc 25V 47μF ±20%	1	1	1	1	
C1013	CQE0121	C,Plastic 600V 0.01μF ±5%			1	1	
C1013	CQE0131	C,Plastic 630V 0.018μF ±5%	1	1			
C1020	CEK0209	C,AL Elyc 100V 22μF ±20%	1	1	1	1	
C1021	CEK0209	C,AL Elyc 100V 22μF ±20%	1	1	1	1	
C1022	CES0134	C,AL Elyc 50V 1μF ±20%	1	1	1	1	
C1023	CQA0101	C,Plastic 50V 47000pF ±10%	1	1	1	1	
C1024	CES0032	C,AL Elyc 25V 47μF ±20%	1	1	1	1	
C1031	CCD0375	C,Ceramic 2000V 10000pF +80% -20%	1	1	1	1	
C1032	CCD0231	C,Ceramic 2000V 4700pF +80% -20%	1	1	1	1	

A:V-660, B:V-665
C:V-1060, D:V-1065

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
C1033	CCD0231	C,Ceramic 2000V 4700pF +80% -20%	1	1	1	1		
C1034	CCD0231	C,Ceramic 2000V 4700pF +80% -20%	1	1	1	1		
C1035	CCD0246	C,Ceramic 2kV 1000pF ±10%	1	1	1	1		
C1040	CCD0286	C,Ceramic 500V 1000pF +100% -0%	1	1	1	1		
C1041	CCD0231	C,Ceramic 2000V 4700pF +80% -20%	1	1	1	1		
C1042	CET0033	C,AL Elyc 160V 1µF ±20%	1	1	1	1		
C1043	CCD0231	C,Ceramic 2000V 4700pF +80% -20%	1	1	1	1		
C1254	CCD0231	C,Ceramic 2000V 4700pF +80% -20%	1	1	1	1		
C1255	CCD0286	C,Ceramic 500V 1000pF +100% -0%	1	1	1	1		
C1256	CCD0231	C,Ceramic 2000V 4700pF +80% -20%	1	1	1	1		
C1257	CCD0231	C,Ceramic 2000V 4700pF +80% -20%	1	1	1	1		
C1258	CQA0037	C,Plastic 250V 0.01µF ±10%	1	1	1	1		
C1259	CQA0037	C,Plastic 250V 0.01µF ±10%	1	1	1	1		
C1280	CCC1030	C,Ceramic 50V 10000pF +80% -20%	1	1	1	1		
C1281	CCD0287	C,Ceramic 500V 4700pF +100% -0%	1	1	1	1		
C1282	CCD0287	C,Ceramic 500V 4700pF +100% -0%	1	1	1	1		
C1502	CCD0338	C,Ceramic 400V 2200pF ±20%	1	1	1	1		
C1503	CCD0338	C,Ceramic 400V 2200pF ±20%	1	1	1	1		
C1504	CCD0338	C,Ceramic 400V 2200pF ±20%	1	1	1	1		
C1505	CCD0338	C,Ceramic 400V 2200pF ±20%	1	1	1	1		
C1506	CEK0179	C,AL Elyc 400V 56µF ±20%	1	1	1	1		
C1507	CEK0208	C,AL Elyc 50V 22µF ±20%	1	1	1	1		
C1508	CEK0186	C,AL Elyc 50V 4.7µF ±20%	1	1	1	1		
C1509	CEK0178	C,AL Elyc 400V 39µF ±20%	1	1	1	1		
C1511	CCD0341	C,Ceramic 1kV 1000pF ±10%	1	1	1	1		
C1512	CEK0184	C,AL Elyc 25V 47µF ±20%	1	1	1	1		
C1513	CCD0341	C,Ceramic 1kV 1000pF ±10%	1	1	1	1		
C1514	CCC1030	C,Ceramic 50V 0.01µF ±10%	1	1	1	1		
C1522	CCD0246	C,Ceramic 2kV 1000pF ±10%	1	1	1	1		
C1531	CEK0180	C,AL Elyc 160V 4.7µF ±20%	1	1	1	1		
C1532	CES0376	C,AL Elyc 160V 4.7µF ±20%	1	1	1	1		
C1533	CES0376	C,AL Elyc 160V 4.7µF ±20%	1	1	1	1		
C1541	CEK0181	C,AL Elyc 63V 47µF ±20%	1	1	1	1		
C1542	CES0377	C,AL Elyc 63V 47µF ±20%	1	1	1	1		
C1551	CEK0182	C,AL Elyc 16V 330µF ±20%	1	1	1	1		
C1552	CES0378	C,AL Elyc 16V 330µF ±20%	1	1	1	1		
C1553	CES0378	C,AL Elyc 16V 330µF ±20%	1	1	1	1		
C1554	CEK0182	C,AL Elyc 16V 330µF ±20%	1	1	1	1		
C1561	CEK0183	C,AL Elyc 10V 470µF ±20%	1	1	1	1		
C1562	CES0379	C,AL Elyc 10V 470µF ±20%	1	1	1	1		
C1563	CES0379	C,AL Elyc 10V 470µF ±20%	1	1	1	1		
C1571	CEK0182	C,AL Elyc 16V 330µF ±20%	1	1	1	1		
C1572	CES0378	C,AL Elyc 16V 330µF ±20%	1	1	1	1		
C1573	CES0318	C,AL Elyc 16V 1000µF ±20%	1	1	1	1		
C1574	CES0378	C,AL Elyc 16V 330µF ±20%	1	1	1	1		
C1593	CES0038	C,AL Elyc 50V 2.2µF ±20%	1	1	1	1		
C1594	CQA0124	C,Plastic 50V 0.1µF ±10%	1	1	1	1		
CV859	CVT0054	C,Variable TZ03Z050NR169 (5P)	1	1	1	1		
D862	HDM0139	Diode MTZ 3.3JA	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
D863	HDM0139	Diode MTZ 3.3JA	1	1	1	1		
D871	HDS0437	Diode 1SS133	1	1	1	1		
D872	HDS0437	Diode 1SS133	1	1	1	1		
D873	HDX0055	Diode 1SS165	1	1				
D873	HDM0051	Diode MA161			1	1		
D874	HDX0055	Diode 1SS165	1	1				
D874	HDM0051	Diode MA161			1	1		
D875	HDS0437	Diode 1SS133	1	1	1	1		
D901	HDS0437	Diode 1SS133	1	1	1	1		
D902	HDX0055	Diode 1SS165	1	1	1	1		
D903	HDS0437	Diode 1SS133	1	1	1	1		
D910	HDS0437	Diode 1SS133	1	1	1	1		
D911	HDM0139	Diode MTZ 3.3JA	1	1	1	1		
D1013	HDR0215	Diode RU3AMLF-B1	1	1	1	1		
D1022	HDS0437	Diode 1SS133	1	1	1	1		
D1023	HDH0175	Diode HZ7A3	1	1	1	1		
D1024	HDS0437	Diode 1SS133	1	1	1	1		
D1026	HDH0019	Diode HZ12B	1	1	1	1		
D1029	HDS0437	Diode 1SS133	1	1	1	1		
D1030	HDS0437	Diode 1SS133	1	1	1	1		
D1031	HDS0437	Diode 1SS133	1	1	1	1		
D1032	HDS0437	Diode 1SS133	1	1	1	1		
D1040	HDS0250	Diode 1SS83	1	1	1	1		
D1041	HDS0250	Diode 1SS83	1	1	1	1		
D1042	HDS0250	Diode 1SS83	1	1	1	1		
D1043	HDS0250	Diode 1SS83	1	1	1	1		
D1271	HDM0141	Diode MTZ 7.5JC	1	1	1	1		
D1280	HDM0141	Diode MTZ 7.5JC	1	1	1	1		
D1281	HDS0250	Diode 1SS83	1	1	1	1		
D1282	HDS0250	Diode 1SS83	1	1	1	1		
D1283	HDS0250	Diode 1SS83	1	1	1	1		
D1284	HDS0250	Diode 1SS83	1	1	1	1		
D1501	HDR0234	Diode RBV-406	1	1	1	1		
D1502	HDG0082	Diode GZB 3.0B	1	1	1	1		
D1503	HDA0071	Diode AU01	1	1	1	1		
D1504	HDA0071	Diode AU01	1	1	1	1		
D1514	HDG0081	Diode GZB 2.4B	1	1	1	1		
D1515	HDG0083	Diode GZB 6.8B	1	1	1	1		
D1520	HDD0141	Diode DTA10E	1	1	1	1		
D1521	HDA0071	Diode AU01	1	1	1	1		
D1531	HDA0074	Diode AU01A	1	1	1	1		
D1541	HDA0071	Diode AU01	1	1	1	1		
D1551	HDF0051	Diode FML-12S	1	1	1	1		
D1561	HDF0052	Diode FMB-24	1	1	1	1		
D1571	HDF0051	Diode FML-12S	1	1	1	1		
D1591	HDS0437	Diode 1SS133	1	1	1	1		
F1001	EFZ0013	ICProtect ICP-F10 (0.4A)	1	1	1	1		
IC1501	IZS0109	IC,Hybrid STK7308	1	1	1	1		
IC1591	HZP0013	Photocopul PC714U	1	1	1	1		
J1502	ETZ0121	Faston 62747-1	1	1	1	1		
J1503	ETZ0121	Faston 62747-1	1	1	1	1		
L1001	TLE0173	Coil ELO607SKI 101K (100µH)	1	1	1	1		
L1002	TLE0172	Coil ELO607SKI 470K (47µH)			1	1		
L1502	TLL0174	Coil LC0243 (24µH)	1	1	1	1		
L1510	TLX0175	Coil BLO2RN1-R62	1	1	1	1		
L1511	TLX0175	Coil BLO2RN1-R62	1	1	1	1		
L1532	TLT0085	Coil 47µH ±10% 0.94A	1	1	1	1		
L1542	TLT0085	Coil 47µH ±10% 0.94A	1	1	1	1		
L1552	TLT0086	Coil 22µH ±10% 1.3 A	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
L1562	TLT0086	Coil 22μH ±10% 1.3 A	1	1	1	1		
L1572	TLT0086	Coil 22μH ±10% 1.3 A	1	1	1	1		
P851	JBB0060	Connector B5B-XH-A	1	1	1	1		
P890	JBB0022	Connector B6B-XH-A	1	1	1	1		
P1042	JBB0022	Connector B6B-XH-A	1	1	1	1		
P1280	JBB0021	Connector B3B-XH-A	1	1	1	1		
P1290	JBB0021	Connector B3B-XH-A	1	1	1	1		
P1501	JBB0024	Connector B15B-XH-A	1	1	1	1		
P1502	JBB0023	Connector B8B-XH-A	1	1	1	1		
R850	RCE0903	R,Carbon 1/4W 1.5MΩ ±5%			1	1		
R850	RSE0434	R,Solid 1/4W 10MΩ ±5%	1	1				
R851	RCE0756	R,Carbon 1/4W 82Ω ±5%	1	1	1	1		
R852	RCE0756	R,Carbon 1/4W 82Ω ±5%	1	1	1	1		
R855	RCE0775	R,Carbon 1/4W 3.3kΩ ±5%			1	1		
R855	RCE0780	R,Carbon 1/4W 8.2kΩ ±5%	1	1				
R856	RCE0775	R,Carbon 1/4W 3.3kΩ ±5%			1	1		
R856	RCE0780	R,Carbon 1/4W 8.2kΩ ±5%	1	1				
R857	RME1383	R,Metal 1W 22kΩ ±5%	1	1	1	1		
R858	RME1383	R,Metal 1W 22kΩ ±5%	1	1	1	1		
R859	RCE0761	R,Carbon 1/4W 220Ω ±5%			1	1		
R859	RCE0758	R,Carbon 1/4W 120Ω ±5%	1	1				
R860	RCE0769	R,Carbon 1/4W 1kΩ ±5%	1	1	1	1		
R861	RCE0769	R,Carbon 1/4W 1kΩ ±5%	1	1	1	1		
R862	RCE0755	R,Carbon 1/4W 68Ω ±5%	1	1	1	1		
R863	RCE0755	R,Carbon 1/4W 68Ω ±5%	1	1	1	1		
R865	RCE0796	R,Carbon 1/4W 180kΩ ±5%	1	1	1	1		
R866	RCE0796	R,Carbon 1/4W 180kΩ ±5%	1	1	1	1		
R867	RCE0778	R,Carbon 1/4W 5.6kΩ ±5%	1	1	1	1		
R868	RCE0778	R,Carbon 1/4W 5.6kΩ ±5%	1	1	1	1		
R869	RZZ0032	R,Fusing 1/4W 470Ω ±5%	1	1	1	1		
R870	RZZ0032	R,Fusing 1/4W 470Ω ±5%	1	1	1	1		
R871	RME1079	R,Metal 1/4W 3.92kΩ ±1%			1	1		
R871	RME1244	R,Metal 1/4W 3.65kΩ ±1%	1	1				
R872	RME1079	R,Metal 1/4W 3.92kΩ ±1%			1	1		
R872	RME1244	R,Metal 1/4W 3.65kΩ ±1%	1	1				
R873	RME1072	R,Metal 1/4W 1.0kΩ ±1%			1	1		
R873	RME1071	R,Metal 1/4W 825Ω ±1%	1	1				
R881	RCE0753	R,Carbon 1/4W 47Ω ±5%	1	1	1	1		
R882	RCE0753	R,Carbon 1/4W 47Ω ±5%	1	1	1	1		
R883	RCE0771	R,Carbon 1/4W 1.5kΩ ±5%	1	1	1	1		
R884	RCE0771	R,Carbon 1/4W 1.5kΩ ±5%	1	1	1	1		
R891	RCE0763	R,Carbon 1/4W 330Ω ±5%			1	1		
R891	RCE0743	R,Carbon 1/4W 4.7Ω ±5%	1	1				
R892	RCE0763	R,Carbon 1/4W 330Ω ±5%			1	1		
R892	RCE0743	R,Carbon 1/4W 4.7Ω ±5%	1	1				
R893	RCE0757	R,Carbon 1/4W 100Ω ±5%	1	1	1	1		
R894	RCE0757	R,Carbon 1/4W 100Ω ±5%	1	1	1	1		
R895	RME1077	R,Metal 1/4W 2.67kΩ ±1%	1	1	1	1		
R896	RME1077	R,Metal 1/4W 2.67kΩ ±1%	1	1	1	1		
R897	RCE0761	R,Carbon 1/4W 220Ω ±5%	1	1	1	1		
R898	RME1082	R,Metal 1/4W 6.81kΩ ±1%	1	1	1	1		
R901	RME1080	R,Metal 1/4W 4.75kΩ ±1%	1	1	1	1		
R902	RCE0781	R,Carbon 1/4W 10kΩ ±5%	1	1	1	1		
R904	RCE0721	R,Carbon 1/2W 22kΩ ±5%	1	1	1	1		
R905	RME1087	R,Metal 1/4W 18.2kΩ ±1%	1	1	1	1		
R907	RCE0753	R,Carbon 1/4W 47Ω ±5%	1	1	1	1		
R908	RCE0768	R,Carbon 1/4W 820Ω ±5%	1	1	1	1		
R909	RCE0790	R,Carbon 1/4W 56kΩ ±5%	1	1	1	1		
R910	RCE0788	R,Carbon 1/4W 39kΩ ±5%	1	1	1	1		
R911	RME1541	R,Metal 2W 6.8kΩ ±5%	1	1	1	1		
R915	RZZ0031	R,Fusing 1/4W 220Ω ±5%	1	1	1	1		
R1001	RCE0782	R,Carbon 1/4W 12kΩ ±5%	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
R1002	RCE0775	R,Carbon 1/4W 3.3kΩ ±5%	1	1	1	1		
R1003	RCE0772	R,Carbon 1/4W 1.8kΩ ±5%	1	1	1	1		
R1004	RCE0775	R,Carbon 1/4W 3.3kΩ ±5%	1	1	1	1		
R1005	RCE0785	R,Carbon 1/4W 22kΩ ±5%	1	1	1	1		
R1006	RCE0769	R,Carbon 1/4W 1.0kΩ ±5%	1	1	1	1		
R1007	RCE0769	R,Carbon 1/4W 1.0kΩ ±5%	1	1	1	1		
R1010	RCE0757	R,Carbon 1/4W 100Ω ±5%	1	1	1	1		
R1011	RCE0693	R,Carbon 1/2W 100Ω ±5%	1	1	1	1		
R1012	RCE0693	R,Carbon 1/2W 100Ω ±5%	1	1	1	1		
R1019	RCE0755	R,Carbon 1/4W 68Ω ±5%	1	1	1	1		
R1020	RCE0779	R,Carbon 1/4W 6.8kΩ ±5%	1	1	1	1		
R1021	RCE0780	R,Carbon 1/4W 8.2kΩ ±5%	1	1	1	1		
R1022	RCE0787	R,Carbon 1/4W 33kΩ ±5%	1	1	1	1		
R1023	RME1261	R,Metal 1/4W 43.2kΩ ±1%	1	1	1	1		
R1024	RME1726	R,Metal 1/4W 24.3kΩ ±1%	1	1	1	1		
R1025	RCE0779	R,Carbon 1/4W 6.8kΩ ±5%	1	1	1	1		
R1026	RCE0775	R,Carbon 1/4W 3.3kΩ ±5%	1	1	1	1		
R1027	RCE0763	R,Carbon 1/4W 330Ω ±5%	1	1	1	1		
R1028	RME1759	R,Metal 2W 3.3kΩ ±5%	1	1	1	1		
R1029	RCE0785	R,Carbon 1/4W 22kΩ ±5%	1	1	1	1		
R1032	RCE0715	R,Carbon 1/2W 6.8kΩ ±5%	1	1	1	1		
R1035	RMV0012	R,Metal 1/2W 15MΩ ±1%	1	1	1	1		
R1040	RCE0798	R,Carbon 1/4W 330kΩ ±5%	1	1	1	1		
R1041	RCE0769	R,Carbon 1/4W 1kΩ ±5%	1	1	1	1		
R1042	RCE0790	R,Carbon 1/4W 56kΩ ±5%	1	1	1	1		
R1043	RSE0434	R,Solid 1/4W 10MΩ ±5%	1	1	1	1		
R1251	RCE0795	R,Carbon 1/4W 150kΩ ±5%	1	1	1	1		
R1252	RMV0012	R,Metal 1/2W 15MΩ ±1%	1	1	1	1		
R1253	RSE0434	R,Solid 1/4W 10MΩ ±5%	1	1	1	1		
R1254	RMV0014	R,Metal 1/2W 6.20MΩ ±1%	1	1	1	1		
R1255	RCE0735	R,Carbon 1/2W 1MΩ ±5%	1	1	1	1		
R1256	RCE0792	R,Carbon 1/4W 82kΩ ±5%	1	1	1	1		
R1257	RCE0794	R,Carbon 1/4W 120kΩ ±5%	1	1	1	1		
R1258	RCE0781	R,Carbon 1/4W 10kΩ ±5%	1	1	1	1		
R1259	RCE0717	R,Carbon 1/2W 10kΩ ±5%	1	1	1	1		
R1260	RCE0725	R,Carbon 1/2W 47kΩ ±5%	1	1	1	1		
R1271	RCE0781	R,Carbon 1/4W 10kΩ ±5%	1	1	1	1		
R1272	RCE0794	R,Carbon 1/4W 120kΩ ±5%	1	1	1	1		
R1280	RCE0786	R,Carbon 1/4W 27kΩ ±5%	1	1	1	1		
R1281	RCE0781	R,Carbon 1/4W 10kΩ ±5%	1	1	1	1		
R1282	RCE0785	R,Carbon 1/4W 22kΩ ±5%	1	1	1	1		
R1283	RCE0757	R,Carbon 1/4W 100Ω ±5%	1	1	1	1		
R1284	RCE0757	R,Carbon 1/4W 100Ω ±5%	1	1	1	1		
R1501	RWK0003	R,Wire 3W 10Ω ±5%	1	1	1	1		
R1502	RWK0007	R,Wire 3W 3.3Ω ±5%	1	1	1	1		
R1503	RCE0729	R,Carbon 1/2W 100kΩ ±5%	1	1	1	1		
R1504	RCE0729	R,Carbon 1/2W 100kΩ ±5%	1	1	1	1		
R1505	RCE0769	R,Carbon 1/4W 1kΩ ±5%	1	1	1	1		
R1506	RCE0784	R,Carbon 1/4W 18kΩ ±5%	1	1	1	1		
R1507	RCE0778	R,Carbon 1/4W 5.6kΩ ±5%	1	1	1	1		
R1508	RCE0779	R,Carbon 1/4W 6.8kΩ ±5%	1	1	1	1		
R1509	RCE0782	R,Carbon 1/4W 12kΩ ±5%	1	1	1	1		
R1512	RMR2791	R,Metal 2W 47Ω ±5%	1	1	1	1		
R1515	RCE0773	R,Carbon 1/4W 2.2kΩ ±5%	1	1	1	1		
R1521	RCE0685	R,Carbon 1/2W 22Ω ±5%	1	1	1	1		
R1522	RMR2789	R,Metal 2W 22Ω ±5%	1	1	1	1		
R1591	RCE0729	R,Carbon 1/2W 100kΩ ±5%	1	1	1	1		
R1592	RCE0729	R,Carbon 1/2W 100kΩ ±5%	1	1	1	1		
R1593	RCE0789	R,Carbon 1/4W 47kΩ ±5%	1	1	1	1		
RV1042	RNE0088	VR,Metal EVM-K3GA00B54(50k)	1	1	1	1		
RV1253	RNE0089	VR,Metal EVM-K3GA00B15(100k)	1	1	1	1		
RV1281	RNE0089	VR,Metal EVM-K3GA00B15(100k)	1	1	1	1		

A:V-660, B:V-665
C:V-1060, D:V-1065

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
RV1506	RNE0087	VR,Metal EVM-K3GA00B53(5k)	1	1	1	1		
S1501	SSP0575	SW,Push SDDS (w/o WIRE TERMINAL)	1	1	1	1		
T1010	TTH0006	Transform H-DRIVE HD-12	1	1	1	1		
T1013	8474287-A	XFMR 10kV(+B=50VDC) FOR V-660	1	1				
T1013	8474287-B	XFMR 15kV(+B=50VDC) FOR V-1060			1	1		
T1501	8482913	XFMR HTH1KA025	1	1	1	1		
TR851	HTC0168	Transistor 2SC535C	1	1	1	1		
TR852	HTC0168	Transistor 2SC535C	1	1	1	1		
TR853	HTC0148	Transistor 2SC458C	1	1	1	1		
TR854	HTC0148	Transistor 2SC458C	1	1	1	1		
TR871	HTA0258	Transistor 2SA1210S	1	1	1	1		
TR872	HTA0258	Transistor 2SA1210S	1	1	1	1		
TR881	HTC0338	Transistor 2SC1906	1	1	1	1		
TR882	HTC0338	Transistor 2SC1906	1	1	1	1		
TR885	HTC0669	Transistor 2SC2912S	1	1	1	1		
TR886	HTC0669	Transistor 2SC2912S	1	1	1	1		
TR901	HTC0192	Transistor 2SC641K-C	1	1	1	1		
TR906	HTC0338	Transistor 2SC1906	1	1	1	1		
TR910	HTA0258	Transistor 2SA1210S	1	1	1	1		
TR912	HTC0669	Transistor 2SC2912S	1	1	1	1		
TR1001	HTA0224	Transistor 2SA1029 D	1	1	1	1		
TR1002	HTA0224	Transistor 2SA1029 D	1	1	1	1		
TR1010	HTC0056	Transistor 2SC1213AC	1	1	1	1		
TR1013	HTC0765	Transistor 2SC3090	1	1	1	1		
TR1020	HTC0148	Transistor 2SC458C	1	1	1	1		
TR1021	HTC0148	Transistor 2SC458C	1	1	1	1		
TR1022	HTA0224	Transistor 2SA1029 D	1	1	1	1		
TR1023	HTA0224	Transistor 2SA1029 D	1	1	1	1		
TR1251	HTA0104	Transistor 2SA778A K	1	1	1	1		
TR1514	HTC0148	Transistor 2SC458C	1	1	1	1		

PEF-785 V OUT

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
	EHN0007	HEAT SINK NZ-5C	1	1	1	1		
	EHN0007	HEAT SINK NZ-5C	1	1	1	1		
C501	CES0133	C,AL Elyc 16V 47µF ±20%	1	1	1	1		
C502	CES0133	C,AL Elyc 16V 47µF ±20%	1	1	1	1		
C503	CES0133	C,AL Elyc 16V 47µF ±20%	1	1	1	1		
C504	CET0033	C,AL Elyc 160V 1µF ±20%	1	1	1	1		
C505	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C509	CCG0205	C,Ceramic,Chip 50V 1000pF ±10%	1	1	1	1		
C510	CCG0205	C,Ceramic,Chip 50V 1000pF ±10%	1	1	1	1		
C516	CCG0194	C,Ceramic,Chip 50V 120pF ±5%	1	1	1	1		
C517	CCG0128	C,Ceramic,Chip 50V 15pF ±5%			1	1		
C517	CCG0134	C,Ceramic,Chip 50V 27pF ±5%	1	1				
C521	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C525	CCG0116	C,Ceramic,Chip 50V 2pF ±0.25pF			1	1		
C526	CCG0116	C,Ceramic,Chip 50V 2pF ±0.25pF			1	1		
C531	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C535	CCG0126	C,Ceramic,Chip 50V 12pF ±5%	1	1	1	1		
C536	CCG0126	C,Ceramic,Chip 50V 12pF ±5%	1	1	1	1		
C543	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
C544	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C555	CCG0124	C,Ceramic,Chip 50V 10pF ±0.5pF			1	1		
C556	CCG0120	C,Ceramic,Chip 50V 6pF ±0.5pF			1	1		
C556	CCG1034	C,Ceramic,Chip 50V 27pF ±5%	1	1				
C557	CES0212	C,AL Elyc 10V 100µF ±20% BP	1	1	1	1		
C558	CCG0209	C,Ceramic,Chip 50V 4700pF ±10%			1	1		
C558	CCG0213	C,Ceramic,Chip 50V 0.1µF ±10%	1	1				
C561	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C565	CQA0037	C,Plastic 250V 0.01µF ±10%	1	1	1	1		
C577	CCG0217	C,Ceramic,Chip 50V 0.047µF ±10%	1	1	1	1		
C578	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C580	CCG0141	C,Ceramic,Chip 50V 68pF ±5%	1	1	1	1		
C582	CCG0179	C,Ceramic,Chip 50V 150pF ±5%	1	1	1	1		
C592	CCG0197	C,Ceramic,Chip 50V 180pF ±5%			1	1		
C592	CCG0200	C,Ceramic,Chip 50V 390pF ±5%	1	1				
C594	CCG0144	C,Ceramic,Chip 50V 220pF ±5%			1	1		
C594	CCG0201	C,Ceramic,Chip 50V 470pF ±5%	1	1				
C1301	CES0133	C,AL Elyc 16V 47µF ±20%	1	1	1	1		
C1302	CCG0203	C,Ceramic,Chip 50V 680pF ±5%	1	1	1	1		
C1303	CCG0205	C,Ceramic,Chip 50V 1000pF ±10%	1	1	1	1		
CV515	CVT0056	C,Variable TZ03Z100NR169 (10P)			1	1		
CV515	CVT0057	C,Variable TZ03T200NR169 (20P)	1	1				
CV517	CVT0056	C,Variable TZ03Z100NR169 (10P)			1	1		
CV517	CVT0057	C,Variable TZ03T200NR169 (20P)	1	1				
CV556	CVT0056	C,Variable TZ03T200NR169 (20P)	1	1	1	1		
D559	HDS0437	Diode 1SS133			1	1		
D591	HDM0141	Diode MTZ 7.5JC	1	1	1	1		
D594	HDS0437	Diode 1SS133	1	1	1	1		
IC1301	IDM0539	IC,Digital MN3102	1	1	1	1		
JP1	RME0912	R,Metal,Chip 0Ω			1	1		
L563	8354946-B	Coil T-COIL(3T,7T)			1	1		
L563	8376798	Coil T-COIL	1	1				
L564	8354946-B	Coil T-COIL(3T,7T)			1	1		
L564	8376798	Coil T-COIL	1	1				
L581	TLE0076	Coil ELO606SKI 100µH ±10%			1	1		
P501	JBS0070	Connector S5B-XH-A	1	1	1	1		
P502	JBB0027	Connector B2B-XH-A	1	1	1	1		
P503	JBB0023	Connector B8B-XH-A	1	1	1	1		
P563	8355704-12	Cord L=60mm Red	1	1	1	1		
P564	8355704-12	Cord L=60mm Red	1	1	1	1		
R501	RCE0775	R,Carbon 1/4W 3.3kΩ ±5%	1	1	1	1		
R503	RME1106	R,Metal 1/4W 75.0Ω ±1%	1	1	1	1		
R504	RME1106	R,Metal 1/4W 75.0Ω ±1%	1	1	1	1		
R505	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R507	RME1290	R,Metal 1/4W 1.1kΩ ±1%	1	1	1	1		
R508	RME1290	R,Metal 1/4W 1.1kΩ ±1%	1	1	1	1		
R509	RME0856	R,Metal,Chip 1/8W 22Ω ±5%	1	1	1	1		
R510	RME0856	R,Metal,Chip 1/8W 22Ω ±5%	1	1	1	1		
R511	RME0866	R,Metal,Chip 1/8W 150Ω ±5%	1	1	1	1		
R512	RME0866	R,Metal,Chip 1/8W 150Ω ±5%	1	1	1	1		
R513	RME0866	R,Metal,Chip 1/8W 150Ω ±5%	1	1	1	1		
R514	RCE0761	R,Carbon 1/4W 220Ω ±5%	1	1	1	1		
R515	RME0877	R,Metal,Chip 1/8W 1.2kΩ ±5%			1	1		
R515	RME0879	R,Metal,Chip 1/8W 1.8kΩ ±5%	1	1				
R516	RME0891	R,Metal,Chip 1/8W 18kΩ ±5%			1	1		

A:V-660, B:V-665
C:V-1060, D:V-1065

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
R516	RME0890	R,Metal,Chip 1/8W 15kΩ ±5%	1	1				
R517	RME0861	R,Metal,Chip 1/8W 56Ω ±5%			1	1		
R517	RME0865	R,Metal,Chip 1/8W 120Ω ±5%	1	1				
R521	RME1078	R,Metal 1/4W 3.32kΩ ±1%	1	1	1	1		
R522	RME1078	R,Metal 1/4W 3.32kΩ ±1%	1	1	1	1		
R524	RME1104	R,Metal 1/4W 51.1Ω ±1%	1	1	1	1		
R524A	RME1086	R,Metal 1/4W 15.0kΩ ±1%	1	1	1	1		
R525	RME0858	R,Metal,Chip 1/8W 33Ω ±5%			1	1		
R526	RME0858	R,Metal,Chip 1/8W 33Ω ±5%			1	1		
R527	RME1064	R,Metal 1/4W 221Ω ±1%	1	1	1	1		
R528	RME1064	R,Metal 1/4W 221Ω ±1%	1	1	1	1		
R529	RCE0715	R,Carbon 1/2W 6.8kΩ ±5%			1	1		
R530	RCE0715	R,Carbon 1/2W 6.8kΩ ±5%			1	1		
R531	RME1066	R,Metal 1/4W 332Ω ±1%	1	1	1	1		
R532	RME1066	R,Metal 1/4W 332Ω ±1%	1	1	1	1		
R533	RME1067	R,Metal 1/4W 392Ω ±1%	1	1	1	1		
R534	RME1067	R,Metal 1/4W 392Ω ±1%	1	1	1	1		
R535	RME0858	R,Metal,Chip 1/8W 33Ω ±5%	1	1	1	1		
R536	RME0858	R,Metal,Chip 1/8W 33Ω ±5%	1	1	1	1		
R537	RME0862	R,Metal,Chip 1/8W 68Ω ±5%	1	1	1	1		
R538	RME0862	R,Metal,Chip 1/8W 68Ω ±5%	1	1	1	1		
R543	RME0858	R,Metal,Chip 1/8W 33Ω ±5%	1	1	1	1		
R544	RME0858	R,Metal,Chip 1/8W 33Ω ±5%	1	1	1	1		
R545	RME1058	R,Metal 1/4W 68.1Ω ±1%			1	1		
R545	RME1061	R,Metal 1/4W 121Ω ±1%	1	1				
R546	RME1058	R,Metal 1/4W 68.1Ω ±1%			1	1		
R546	RME1061	R,Metal 1/4W 121Ω ±1%	1	1				
R547	RME1058	R,Metal 1/4W 68.1Ω ±1%			1	1		
R547	RME1061	R,Metal 1/4W 121Ω ±1%	1	1				
R548	RME1058	R,Metal 1/4W 68.1Ω ±1%			1	1		
R548	RME1061	R,Metal 1/4W 121Ω ±1%	1	1				
R549	RME1048	R,Metal 1/4W 10.0Ω ±1%	1	1	1	1		
R550	RME1048	R,Metal 1/4W 10.0Ω ±1%	1	1	1	1		
R551	RME1063	R,Metal 1/4W 182Ω ±1%			1	1		
R551	RME1066	R,Metal 1/4W 332Ω ±1%	1	1				
R552	RME1063	R,Metal 1/4W 182Ω ±1%			1	1		
R552	RME1066	R,Metal 1/4W 332Ω ±1%	1	1				
R553	RME1063	R,Metal 1/4W 182Ω ±1%			1	1		
R553	RME1066	R,Metal 1/4W 332Ω ±1%	1	1				
R554	RME1063	R,Metal 1/4W 182Ω ±1%			1	1		
R554	RME1066	R,Metal 1/4W 332Ω ±1%	1	1				
R555	RME1104	R,Metal 1/4W 51.1Ω ±1%			1	1		
R555	RME1059	R,Metal 1/4W 82.5Ω ±1%	1	1				
R556	RME0863	R,Metal,Chip 1/8W 82Ω ±5%			1	1		
R556	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1				
R557	RME0883	R,Metal,Chip 1/8W 3.9kΩ ±5%			1	1		
R557	RME0887	R,Metal,Chip 1/8W 8.2kΩ ±5%	1	1				
R558	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%			1	1		
R558	RME0895	R,Metal,Chip 1/8W 39kΩ ±5%	1	1				
R559	RME0871	R,Metal,Chip 1/8W 390Ω ±5%			1	1		
R559	RME0912	R,Metal,Chip 0Ω	1	1				
R560	RCE0717	R,Carbon 1/2W 10kΩ ±5%			1	1		
R561	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%			1	1		
R563	RME0863	R,Metal,Chip 1/8W 82Ω ±5%			1	1		
R563	RME0869	R,Metal,Chip 1/8W 270Ω ±5%	1	1				
R564	RME0863	R,Metal,Chip 1/8W 82Ω ±5%			1	1		
R564	RME0869	R,Metal,Chip 1/8W 270Ω ±5%	1	1				
R565	RMR4032	R,Metal (w/o Fin)2W 390Ω ±2%			1	1		
R565	RMR2844	R,Metal 5W 680Ω ±1%	1	1				
R566	RMR4032	R,Metal (w/o Fin)2W 390Ω ±2%			1	1		
R566	RMR2844	R,Metal,Chip 5W 680Ω ±1%	1	1				
R571A	RME0871	R,Metal,Chip 1/8W 390Ω ±5%			1	1		
R571B	RME0871	R,Metal,Chip 1/8W 390Ω ±5%	1	1				

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
R572A	RME0871	R,Metal,Chip 1/8W 390Ω ±5%			1	1		
R572B	RME0871	R,Metal,Chip 1/8W 390Ω ±5%	1	1				
R573	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R574	RME0890	R,Metal,Chip 1/8W 15kΩ ±5%	1	1	1	1		
R575	RME0874	R,Metal,Chip 1/8W 680Ω ±5%	1	1	1	1		
R576	RME0863	R,Metal,Chip 1/8W 82Ω ±5%	1	1	1	1		
R577	RME0894	R,Metal,Chip 1/8W 33kΩ ±5%	1	1	1	1		
R578	RME1077	R,Metal 1/4W 2.67kΩ ±1%	1	1	1	1		
R579	RME1077	R,Metal 1/4W 2.67kΩ ±1%	1	1	1	1		
R580	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R581	RME0878	R,Metal,Chip 1/8W 1.5kΩ ±5%	1	1	1	1		
R582	RME0878	R,Metal,Chip 1/8W 1.5kΩ ±5%	1	1	1	1		
R590	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R591	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R592	RME0900	R,Metal,Chip 1/8W 100kΩ ±5%	1	1	1	1		
R593	RME0896	R,Metal,Chip 1/8W 47kΩ ±5%	1	1	1	1		
R594	RME0868	R,Metal,Chip 1/8W 220Ω ±5%	1	1	1	1		
R1301	RME1198	R,Metal,Chip 1/8W 390kΩ ±5%	1	1	1	1		
R1302	RME0895	R,Metal,Chip 1/8W 39kΩ ±5%	1	1	1	1		
R1303	RME1174	R,Metal 1/4W 2.00kΩ ±1%	1	1	1	1		
R1304	RME0860	R,Metal,Chip 1/8W 47Ω ±5%	1	1	1	1		
R1305	RME1065	R,Metal 1/4W 267Ω ±1%	1	1	1	1		
RV505	RNE0048	VR,Metal EVN 39C00YB22(200)	1	1	1	1		
RV574	RNE0051	VR,Metal EVN 39C00YB14(10k)	1	1	1	1		
RV576	RNE0049	VR,Metal EVN 39C00YB12(100)	1	1	1	1		
RV1303	RNE0050	VR,Metal EVN 39C00YB52(500)	1	1	1	1		
TR501	HTC0907	Transistor,Chip 2SC3775 OY	1	1	1	1		
TR502	HTC0907	Transistor,Chip 2SC3775 OY	1	1	1	1		
TR503	HTC0907	Transistor,Chip 2SC3775 OY	1	1	1	1		
TR504	HTC0907	Transistor,Chip 2SC3775 OY	1	1	1	1		
TR541	HTC0885	Transistor 2SC2407(1)	1	1	1	1		
TR542	HTC0885	Transistor 2SC2407(1)	1	1	1	1		
TR561A	HTC0397	Transistor 2SC1252N	1	1	1	1		
TR562A	HTC0397	Transistor 2SC1252N	1	1	1	1		
TR571	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR572	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR591	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		

PEF-786 DLY 1

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
P491	JBX2203	Connector 03JQ-ST	1	1	1	1		

A:V-660, B:V-665
C:V-1060, D:V-1065

PEF-787 DLY 2

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
P493	JBX2210	Connector 05JQ-ST	1	1				

PEF-788 DLY 3

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
C501	CCG0120	C,Ceramic,Chip 50V 6pF ±0.5pF			1	1		
C502	CCG0120	C,Ceramic,Chip 50V 6pF ±0.5pF			1	1		
L501	TLN0004	Coil 0.10μH 450MA ±20%			1	1		
L502	TLN0004	Coil 0.10μH 450MA ±20%			1	1		
P492	JBX2210	Connector 05JQ-ST			1	1		

PEF-789 CRT SOCKET 1

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
C1044	CCD0231	C,Ceramic 2000V 4700pF +80% -20%			1	1		
C1045	CCC1025	C,Ceramic 50V 100pF ±10%			1	1		
J1001	8390152	Socket 1339			1	1		
L1061	TLE0107	Inductor ELE-V R47 MA			1	1		
L1062	TLE0107	Inductor ELE-V R47 MA			1	1		
NL1043	ELS0032	Lamp SA-200DSS-ON-1			1	1		
P1001	JBS0022	Connector S3B-XH-A			1	1		
P1043	JBB0022	Connector B6B-XH-A			1	1		
P1061	ETP0002	Pin 171255-1			1	1		
P1062	ETP0002	Pin 171255-1			1	1		
P1281	JBB0021	Connector B3B-XH-A			1	1		
R1061	RME1722	R,Metal 1/4W 165Ω ±1%			1	1		
R1062	RME1722	R,Metal 1/4W 165Ω ±1%			1	1		
R1066	RCE0781	R,Carbon 1/4W 10kΩ ±5%			1	1		
R1067	RCE0745	R,Carbon 1/4W 10Ω ±5%			1	1		

PEF-816 FILTER

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
C1501	CQE0118	C,Plastic ECQ-E2A224MW	1	1	1	1		
C1510	CQE0118	C,Plastic ECQ-E2A224MW	1	1	1	1		
L1501	TLP0043	Coil 250VAC 15MA	1	1	1	1		
SG1501	EZH0084	Spark Gap AG20 P C 252F-L3N	1	1	1	1		
SG1502	EZH0084	Spark Gap AG20 P C 252F-L3N	1	1	1	1		
R1510	RCE0733	R,Carbon 1/2W 470kΩ ±5%	1	1	1	1		

A:V-660, B:V-665
C:V-1060, D:V-1065

PEF-817 ROM PG

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
	IYX0041	IC Socket 10628-01-445	1	1	1	1		
	IYT0003	SEAL (ROM) 11X11MM T-TYPE MAT SILVER	1	1	1	1		
C3001	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C3002	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C3003	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C3004	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C3005	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C3006	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C3007	CCG0179	C,Ceramic,Chip 50V 150pF ±5%	1	1	1	1		
C3010	CCG0205	C,Ceramic,Chip 50V 1000pF ±5%	1	1	1	1		
C3011	CCG0205	C,Ceramic,Chip 50V 1000pF ±5%	1	1	1	1		
C3012	CCG0205	C,Ceramic,Chip 50V 1000pF ±5%	1	1	1	1		
C3013	CCG0205	C,Ceramic,Chip 50V 1000pF ±5%	1	1	1	1		
C3014	CCG0205	C,Ceramic,Chip 50V 1000pF ±5%	1	1	1	1		
C3015	CCG0179	C,Ceramic,Chip 50V 150pF ±5%	1	1	1	1		
C3016	CCG0179	C,Ceramic,Chip 50V 150pF ±5%	1	1	1	1		
C3101	CCG0136	C,Ceramic,Chip 50V 33pF ±5%	1	1	1	1		
C3102	CCG0136	C,Ceramic,Chip 50V 33pF ±5%	1	1	1	1		
C3105	CCG0213	C,Ceramic,Chip 50V 0.1µF +80% -20%	1	1	1	1		
C3106	CCG0213	C,Ceramic,Chip 50V 0.1µF +80% -20%	1	1	1	1		
C3107	CES0133	C,AL Elyc 16V 47µF ±20%	1	1	1	1		
C3108	CCG0211	C,Ceramic,Chip 50V 1000pF ±10%	1	1	1	1		
C3109	CCG0211	C,Ceramic,Chip 50V 1000pF ±10%	1	1	1	1		
IC3001	IDH0965	IC,Digital HN4827128G-25	1	1	1	1		
IC3002	IDH1051	IC,Digital HD74HC74P	1	1	1	1		
IC3003	IDH1274	IC,Digital HD74HC573P/TC74HC573P	1	1	1	1		
IC3004	IDH1275	IC,Digital HD74HC574P/TC74HC574P	1	1	1	1		
IC3005	IDH1275	IC,Digital HD74HC574P/TC74HC574P	1	1	1	1		
IC3006	IDH1019	IC,Digital HD74HC32P	1	1	1	1		
IC3101	IDM0685	IC,Digital µPD78C10G-36	1	1	1	1		
P3001	JBS0027	Connector SQ-8-AP-GB-C	1	1	1	1		
P3002	JBS0027	Connector SQ-8-AP-GB-C	1	1	1	1		
P3003	JBS0027	Connector SQ-8-AP-GB-C	1	1	1	1		
P3004	JBS0027	Connector SQ-8-AP-GB-C	1	1	1	1		
P3005	JBS0027	Connector SQ-8-AP-GB-C	1	1	1	1		
P3006	JBS0027	Connector SQ-8-AP-GB-C	1	1	1	1		
P3007	JBS0027	Connector SQ-8-AP-GB-C	1	1	1	1		
P3008	JBS0027	Connector SQ-8-AP-GB-C	1	1	1	1		
R3002	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R3003	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R3004	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R3005	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R3006	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R3010	RME0875	R,Metal,Chip 1/8W 820Ω ±5%	1	1	1	1		
R3011	RME0875	R,Metal,Chip 1/8W 820Ω ±5%	1	1	1	1		
R3012	RME0875	R,Metal,Chip 1/8W 820Ω ±5%	1	1	1	1		
R3013	RME0875	R,Metal,Chip 1/8W 820Ω ±5%	1	1	1	1		
R3014	RME0875	R,Metal,Chip 1/8W 820Ω ±5%	1	1	1	1		
R3015	RME0875	R,Metal,Chip 1/8W 820Ω ±5%	1	1	1	1		
R3016	RME0875	R,Metal,Chip 1/8W 820Ω ±5%	1	1	1	1		
R3017	RME0875	R,Metal,Chip 1/8W 820Ω ±5%	1	1	1	1		
R3018	RME0875	R,Metal,Chip 1/8W 820Ω ±5%	1	1	1	1		
R3101	RME0906	R,Metal,Chip 1/8W 1.0MΩ ±5%	1	1	1	1		
X3101	EZZ0101	Extal CSA 12.0MT	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F

PEF-833 ATT R/O

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
RM53	RZA0202	R,Block EXB-LE5-502S		2		2		

PEF-835 CRT SOCKET 2

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
C1054	CCD0231	C,Ceramic 2000V 4700pF +80% -20%	1	1				
C1055	CCC1025	C,Ceramic 50V 100pF ±10%	1	1				
J1011	8390152	Socket 1339	1	1				
L1071	TLE0109	Inductor ELE-V R68 MA 0.68µH	1	1				
L1072	TLE0109	Inductor ELE-V R68 MA 0.68µH	1	1				
NL1053	ELS0032	Lamp SA-200DSS-ON-1	1	1				
P1011	JBS0022	Connector S3B-XH-A	1	1				
P1053	JBB0022	Connector B6B-XH-A	1	1				
P1071	ETP0002	Pin 171255-1	1	1				
P1072	ETP0002	Pin 171255-1	1	1				
P1291	JBB0021	Connector B3B-XH-A	1	1				
R1071	RME1062	R,Metal 1/4W 150Ω ±1%	1	1				
R1072	RME1062	R,Metal 1/4W 150Ω ±1%	1	1				
R1076	RCE0781	R,Carbon 1/4W 10kΩ ±5%	1	1				
R1077	RCE0743	R,Carbon 1/4W 4.7Ω ±5%	1	1				

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F

PEF-837 CYCLE

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
C2003	CES0033	C,AL Elyc 25V 100μF ±20%	1	1	1	1		
C2005	CQA0121	C,Plastic 50V 33000pF ±10%	1	1	1	1		
C2006	CQA0122	C,Plastic 50V 47000pF ±10%	1	1	1	1		
C2007	CES0378	C,AL Elyc 16V 330μF ±20%	1	1	1	1		
C2008	CES0378	C,AL Elyc 16V 330μF ±20%	1	1	1	1		
C2012	CMD0947	C,Mica 300V 470pF ±5%	1	1	1	1		
C2013	CQE0116	C,Plastic 100V 0.47μF ±5%	1	1	1	1		
C2014	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2015	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C2016	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2017	CQA0132	C,Plastic 50V 0.33μF ±10%	1	1	1	1		
C2038	CQA0132	C,Plastic 50V 0.33μF ±10%	1	1	1	1		
C2039	CCG0213	C,Ceramic,Chip 50V 0.1μF +80% -20%	1	1	1	1		
C2042	CCG0207	C,Ceramic,Chip 50V 2200pF ±10%	1	1	1	1		
C2043	CEC0038	C,AL Elyc 50V 2.2μF ±20%	1	1	1	1		
C2050	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2051	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2052	CCG0211	C,Ceramic,Chip 50V 10000pF ±10%	1	1	1	1		
C2060	CCG0136	C,Ceramic,Chip 50V 33pF ±5%	1	1	1	1		
C2061	CCG0211	C,Ceramic,Chip 50V 10000pF ±5%	1	1	1	1		
C2070	CES0133	C,AL Elyc 16V 47μF ±20%	1	1	1	1		
C2071	CES0133	C,AL Elyc 16V 47μF ±20%	1	1	1	1		
C2072	CES0133	C,AL Elyc 16V 47μF ±20%	1	1	1	1		
C2092	CCG0144	C,Ceramic,Chip 50V 220pF ±5%	1	1	1	1		
D2004	HDS0437	Diode 1SS 133	1	1	1	1		
D2020	HDM0139	Diode MTZ 3.3JA	1	1	1	1		
IC2040	ILT0045	IC,Analog TL064CN	1	1	1	1		
IC2050	ILN0085	IC,Analog NJM 319D	1	1	1	1		
IC2052	IDH0467	IC,Degital HD74LS74AP	1	1	1	1		
IC2090	HTD0161	Transistor,Chip DTC124K	1	1	1	1		
IC2091	HTD0161	Transistor,Chip DTC124K	1	1	1	1		
L2092	TLE0072	Coil ELO606SKI 220μF±10%	1	1	1	1		
P2001	JBS0071	Connector SQ-10-AP-GB-C	1	1	1	1		
P2002	JBS0027	Connector SQ-8-AP-GB-C	1	1	1	1		
R2001	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R2002	RME0902	R,Metal,Chip 1/8W 220kΩ ±5%	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
R2003	RME0869	R,Metal,Chip 1/8W 270Ω ±5%	1	1	1	1		
R2004	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R2005	RCE1716	R,Carbon 1/8W 2.2MΩ ±10%	1	1	1	1		
R2006	RME1716	R,Metal,Chip 1/8W 2.2MΩ ±10%	1	1	1	1		
R2007	RME1064	R,Metal 1/4W 221Ω ±1%	1	1	1	1		
R2010	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R2011	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
R2012	RME0896	R,Metal,Chip 1/8W 47kΩ ±5%	1	1	1	1		
R2013	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R2014	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R2015	RME0896	R,Metal,Chip 1/8W 47kΩ ±5%	1	1	1	1		
R2017	RME0912	R,Metal,Chip 1/8W 0Ω	1	1	1	1		
R2020	RCE0716	R,Carbon 1/2W 8.2kΩ ±5%	1	1	1	1		
R2021	RME1714	R,Metal 1/4W 221kΩ ±0.5%	1	1	1	1		
R2022	RME1713	R,Metal 1/4W 22.1kΩ ±0.5%	1	1	1	1		
R2023	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R2024	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R2025	RME1712	R,Metal 1/4W 2.21kΩ ±0.5%	1	1	1	1		
R2026	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R2027	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R2029	RME0855	R,Metal,Chip 1/8W 18Ω ±5%	1	1	1	1		
R2030	RME0864	R,Metal,Chip 1/8W 100Ω ±5%	1	1	1	1		
R2031	RME1098	R,Metal 1/4W 150kΩ ±1%	1	1	1	1		
R2032	RME1086	R,Metal 1/4W 15kΩ ±1%	1	1	1	1		
R2033	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R2034	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R2035	RME1074	R,Metal 1/4W 1.5kΩ ±1%	1	1	1	1		
R2036	RME0884	R,Metal,Chip 1/8W 4.7kΩ ±5%	1	1	1	1		
R2037	RME0888	R,Metal,Chip 1/8W 10kΩ ±5%	1	1	1	1		
R2038	RME1090	R,Metal 1/4W 33.2kΩ ±1%	1	1	1	1		
R2039	RME1090	R,Metal 1/4W 33.2kΩ ±1%	1	1	1	1		
R2040	RME0878	R,Metal,Chip 1/8W 1.5kΩ ±1%	1	1	1	1		
R2041	RME0875	R,Metal,Chip 1/8W 820Ω ±5%	1	1	1	1		
R2043	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R2045	RME0912	R,Metal,Chip 0Ω	1	1	1	1		
R2052	RME0881	R,Metal,Chip 1/8W 2.7kΩ ±5%	1	1	1	1		
R2054	RME0869	R,Metal,Chip 1/8W 270Ω ±5%	1	1	1	1		
R2055	RME0902	R,Metal,Chip 1/8W 220kΩ ±5%	1	1	1	1		
R2060	RME0869	R,Metal,Chip 1/8W 270Ω ±5%	1	1	1	1		
R2061	RME1077	R,Metal 1/4W 2.67kΩ ±1%	1	1	1	1		
R2062	RME1083	R,Metal 1/4W 8.25kΩ ±1%	1	1	1	1		
R2063	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R2065	RME0872	R,Metal,Chip 1/8W 470Ω ±5%	1	1	1	1		
R2080	RME1290	R,Metal 1/4W 1.1kΩ ±1%	1	1	1	1		
R2081	RME1078	R,Metal 1/4W 3.32kΩ ±1%	1	1	1	1		
R2082	RME1718	R,Metal,Chip 1/8W 5.6MΩ ±10%	1	1	1	1		
R2085	RME0880	R,Metal,Chip 1/8W 2.2kΩ ±5%	1	1	1	1		
R2092	RME0892	R,Metal,Chip 1/8W 22kΩ ±5%	1	1	1	1		
R2093	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R2094	RME0876	R,Metal,Chip 1/8W 1.0kΩ ±5%	1	1	1	1		
R2095	RME0882	R,Metal,Chip 1/8W 3.3kΩ ±5%	1	1	1	1		
TR2010	HTC0590	Transistor,Chip 2SC1621B4	1	1	1	1		
TR2013	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR2015	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		
TR2022	HTB0177	Transistor,Chip 2SB624BV3	1	1	1	1		
TR2025	HTB0177	Transistor,Chip 2SB624BV3	1	1	1	1		
TR2032	HTB0177	Transistor,Chip 2SB624BV3	1	1	1	1		
TR2035	HTB0177	Transistor,Chip 2SB624BV3	1	1	1	1		
TR2038	HTC0813	Transistor,Chip 2SC2853E	1	1	1	1		
TR2040	HTC0590	Transistor,Chip 2SC1621B4	1	1	1	1		
TR2043	HTD0202	Transistor,Chip 2SD596DV3	1	1	1	1		
TR2045	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
TR2060	HTK0160	Transistor,Chip 2SK303V4	1	1	1	1		
TR2063	HTC0686	Transistor,Chip 2SC2462LC	1	1	1	1		
TR2080	HTA0263	Transistor,Chip 2SA1052MD	1	1	1	1		

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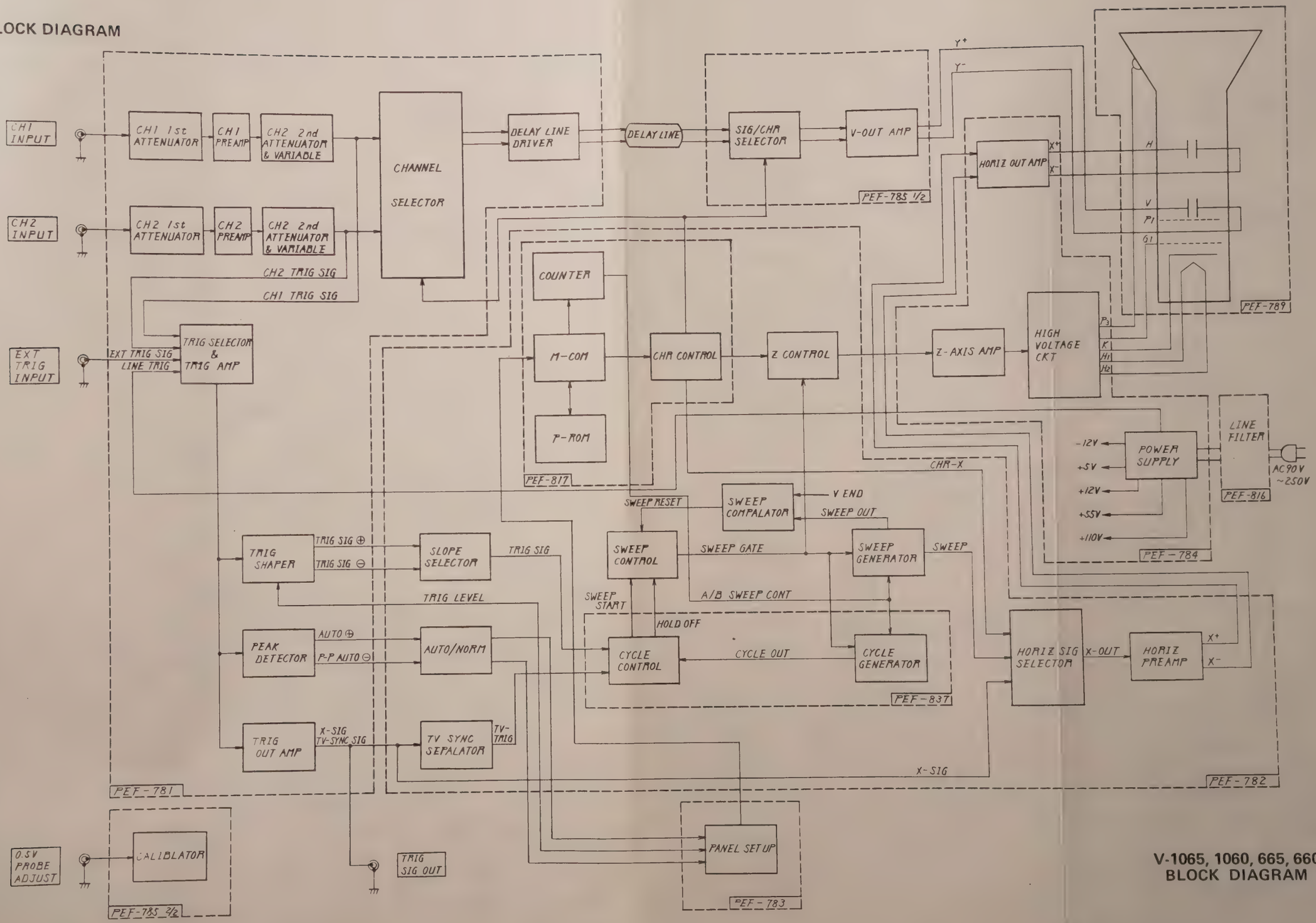
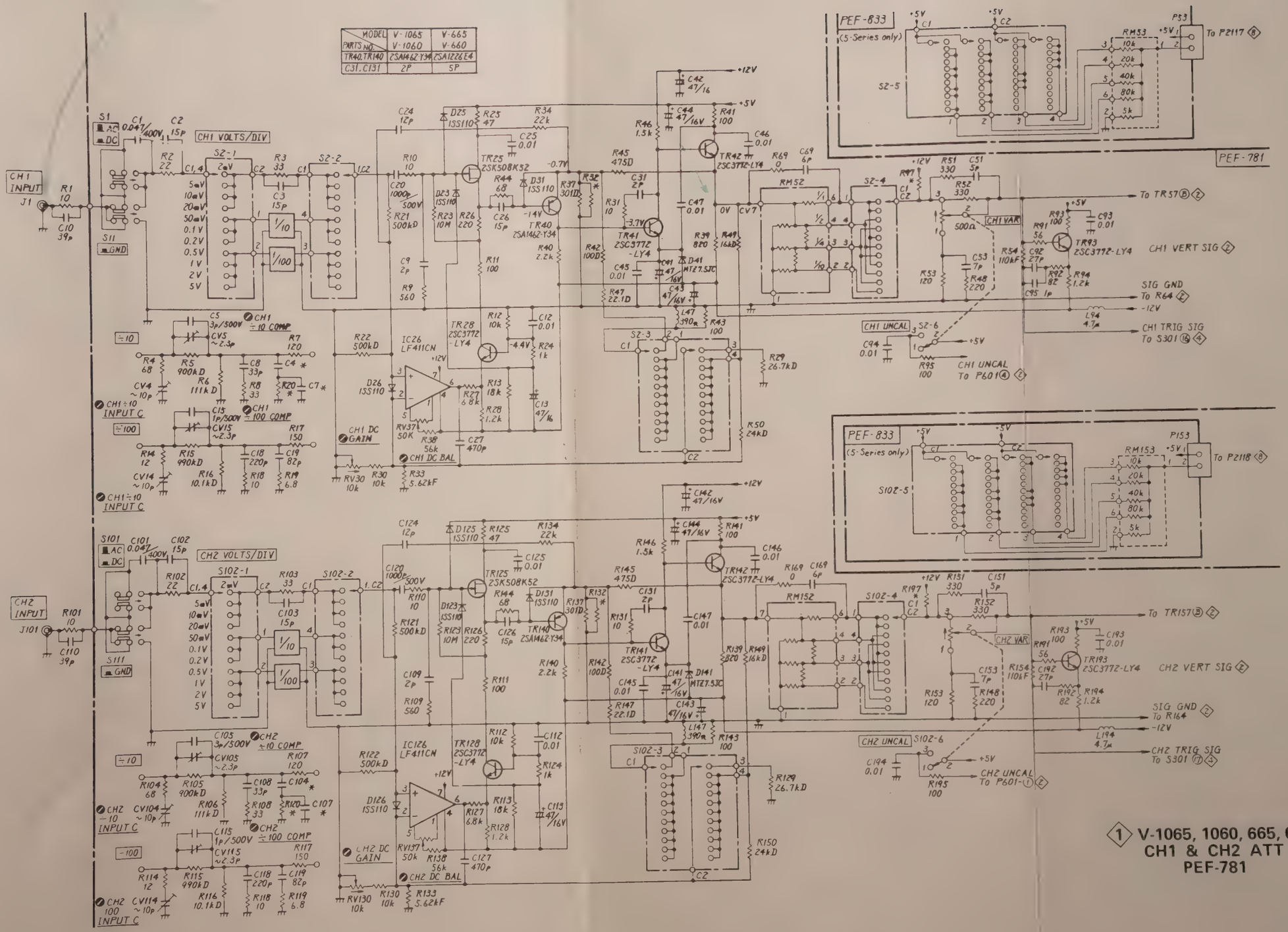
SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
	3211475-BA	Cable,Assy 3211475-BA	1	1	1	1		
	3211475-CA	Cable,Assy 3211475-CA	1	1	1	1		
	3211475-CB	Cable,Assy 3211475-CB	1	1	1	1		
	3211475-DA	Cable,Assy 3211475-DA	1	1	1	1		
	3211475-EA	Cable,Assy 3211475-EA	1	1	1	1		
	3211475-FA	Cable,Assy 3211475-FA		1		1		
	3211475-HA	Cable,Assy 3211475-HA	1	1	1	1		
	3211475-KB	Cable,Assy 3211475-KB	1	1	1	1		
	3211475-NA	Cable,Assy 3211475-NA		1		1		
	3211475-NB	Cable,Assy 3211475-NB		1		1		
	3211475-PA	Cable,Assy 3211475-PA	1	1	1	1		
	3211475-QA	Cable,Assy 3211475-QA	1	1	1	1		
	3211475-RA	Cable,Assy 3211475-RA	1	1	1	1		
	3211475-SA	Cable,Assy 3211475-SA	1	1	1	1		
	3211475-TA	Cable,Assy 3211475-TA	1	1	1	1		
	3211475-VA	Cable,Assy 3211475-VA	1	1	1	1		
	3211476-A	Cable,Assy FOR ROT,COIL	1	1	1	1		
	8478324-5	Cable,Assy FASTON60196-3L=110MMG&Y	1	1	1	1		
	8478324	Cable,Assy 8478324	1	1	1	1		
	8474248	Tip CZ174	1	1	1	1		
C10	CCC1013	C,Ceramic 50V 39pF ±5%	1	1	1	1		
C110	CCC1013	C,Ceramic 50V 39pF ±5%	1	1	1	1		
C303	CCC1136	C,Ceramic 50V 100pF ±5%		1		1		
DL490	8471176	Delay line 77NS 140Ω 15M FOR V-660	1	1	1	1		
F1501	EFG0575	Fuse EAK2A (Time lag 250V 2A)	2	2	2	2		
J1	JHB0088	Coax,Con BNC071	1	1	1	1		
J101	JHB0088	Coax,Con BNC071	1	1	1	1		
J301	JHB0088	Coax,Con BNC071	1	1	1	1		
J302	JHB0088	Coax,Con BNC071		1		1		
J502	8474249	Tip CZ121	1	1	1	1		
J1501	JSG0002	Socket GSI42R32-3111-150	1	1	1	1		
J2605	JHB0088	Coax,Con BNC071	1	1	1	1		
L1001	3211498	Coil Trace rotation	1	1	1	1		
R1	RCE0745	R,Carbon 1/4W 10Ω ±5%	1	1	1	1		
R101	RCE0745	R,Carbon 1/4W 10Ω ±5%	1	1	1	1		
R301	RCE0756	R,Carbon 1/4W 82Ω ±5%	1	1	1	1		
V1001	DPX0091	CRT E8354B31			1	1		
V1001	DPX0090	CRT 150DGB31	1	1				

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F

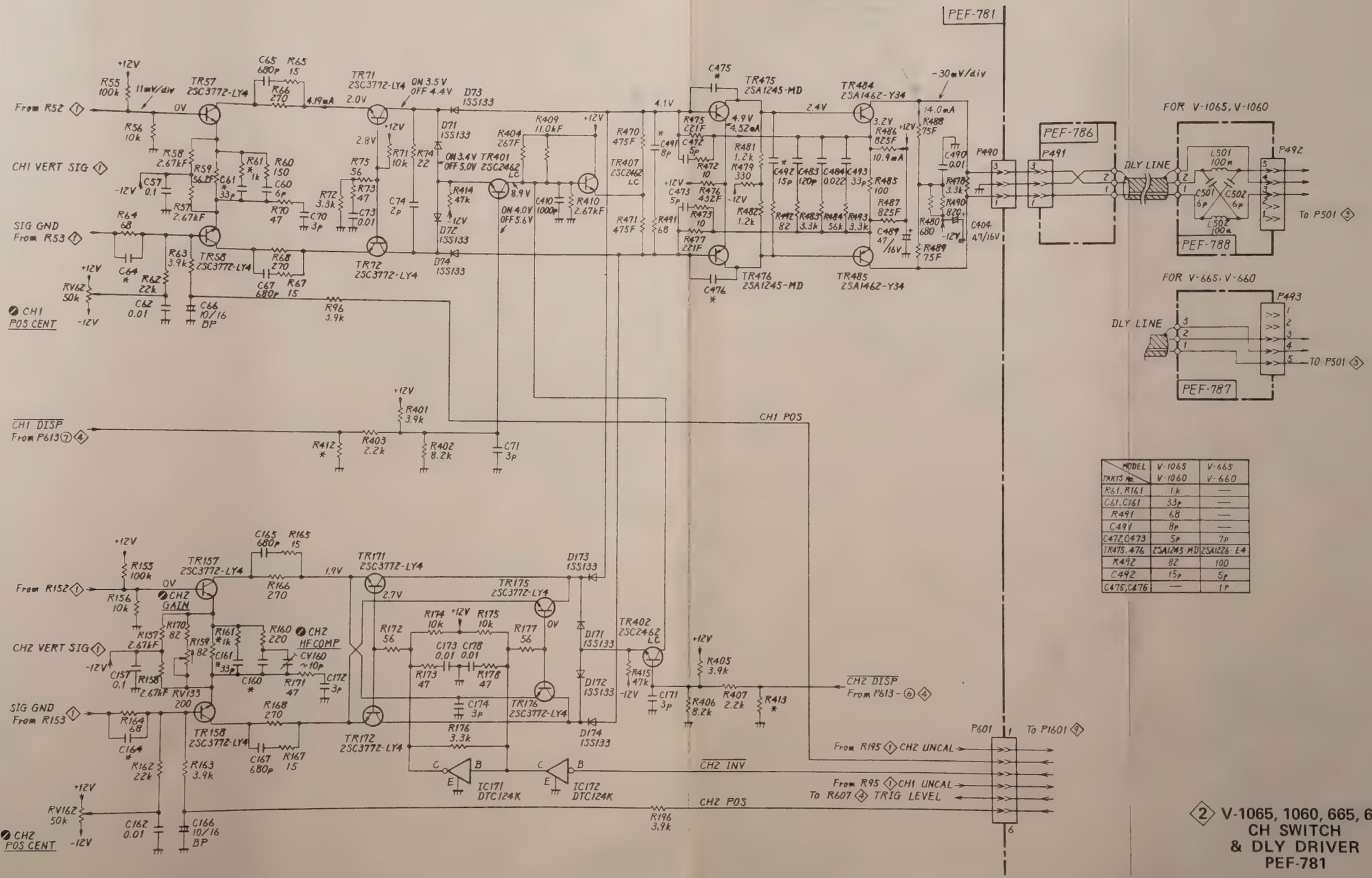
9. GENERAL BLOCK DIAGRAM



V-1065, 1060, 665, 660
BLOCK DIAGRAM

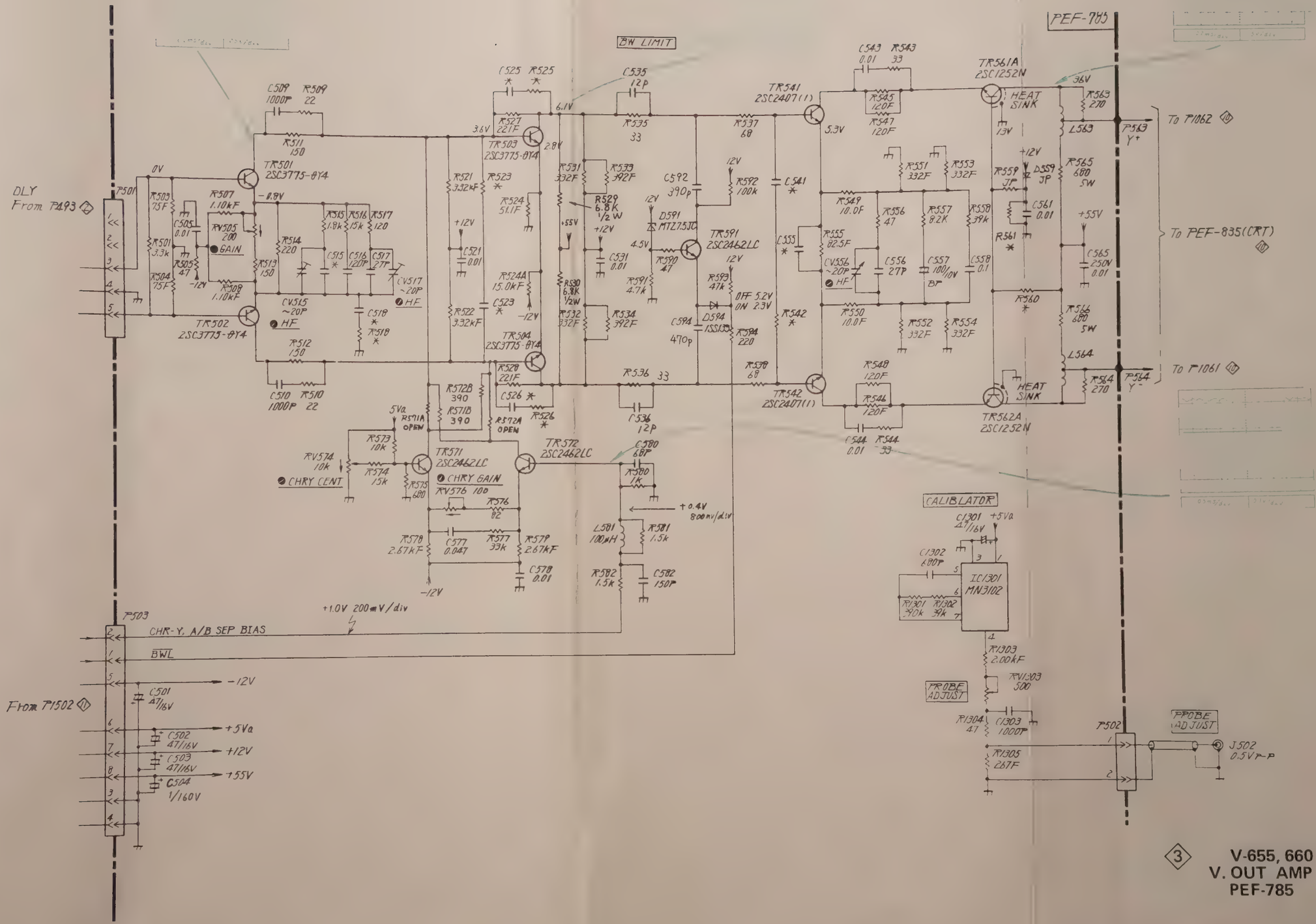


① V-1065, 1060, 665, 660
CH1 & CH2 ATT
PEF-781

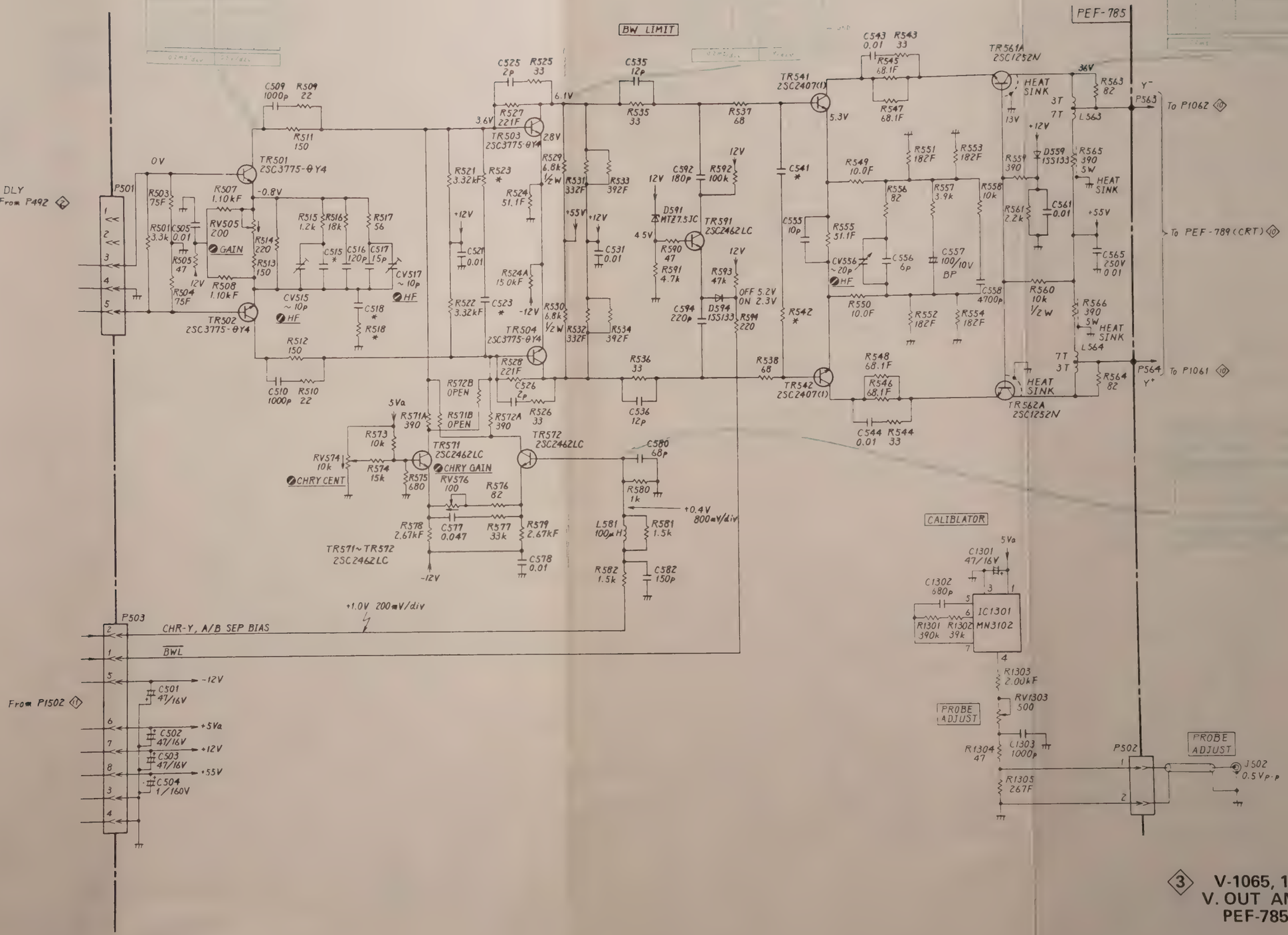


MODEL / PARTS NO.	V-1065 V-1060	V-665 V-660
R61, R161	1k	—
C61, C161	33p	—
R491	68	—
C491	8p	—
C472, C473	5p	7p
TR475, 476	2SA1245-MD	2SA1226-E4
R492	82	100
C492	15p	5p
C475, C476	—	1p

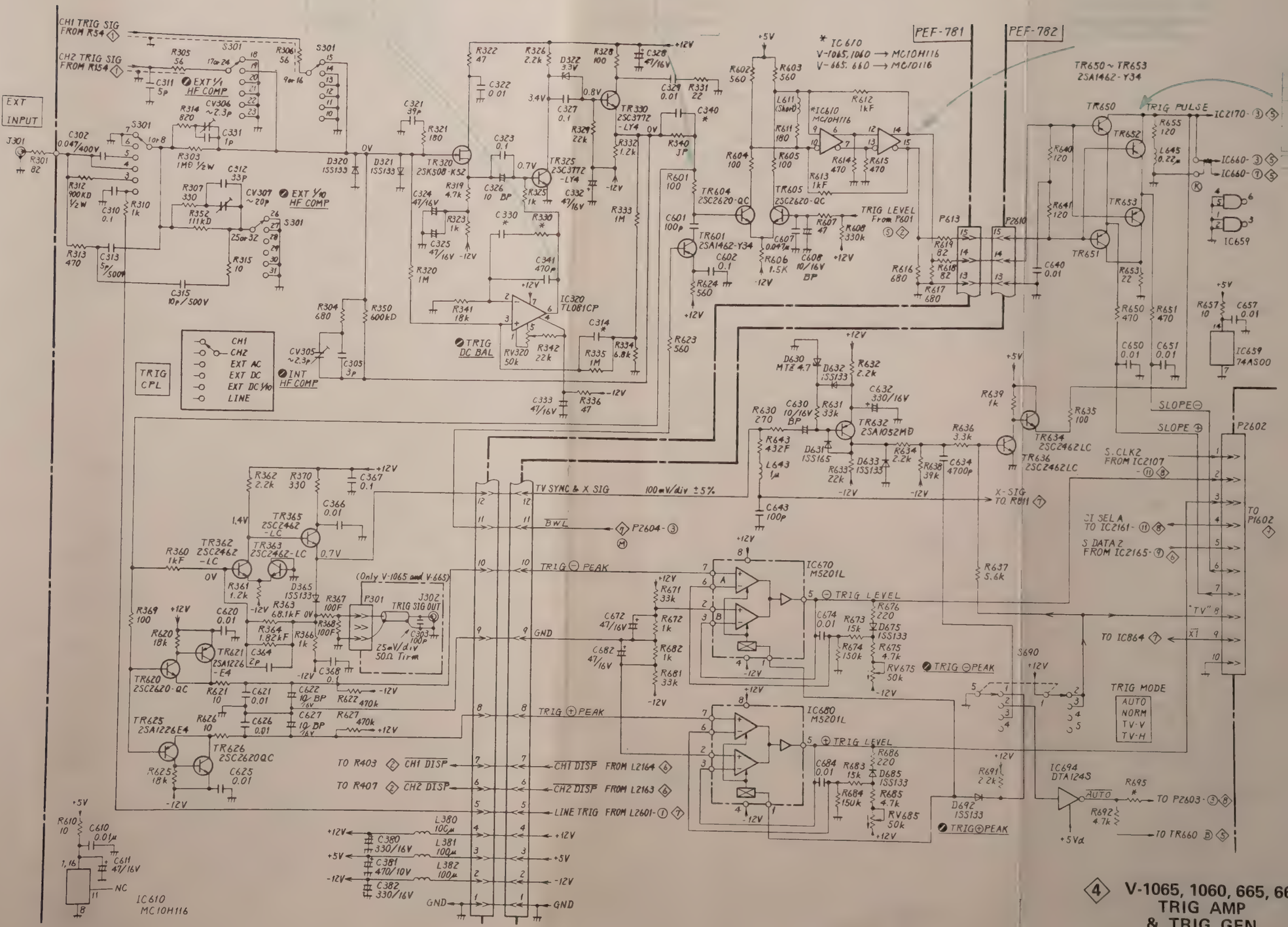
② V-1065, 1060, 665, 660 CH SWITCH & DLY DRIVER PEF-781



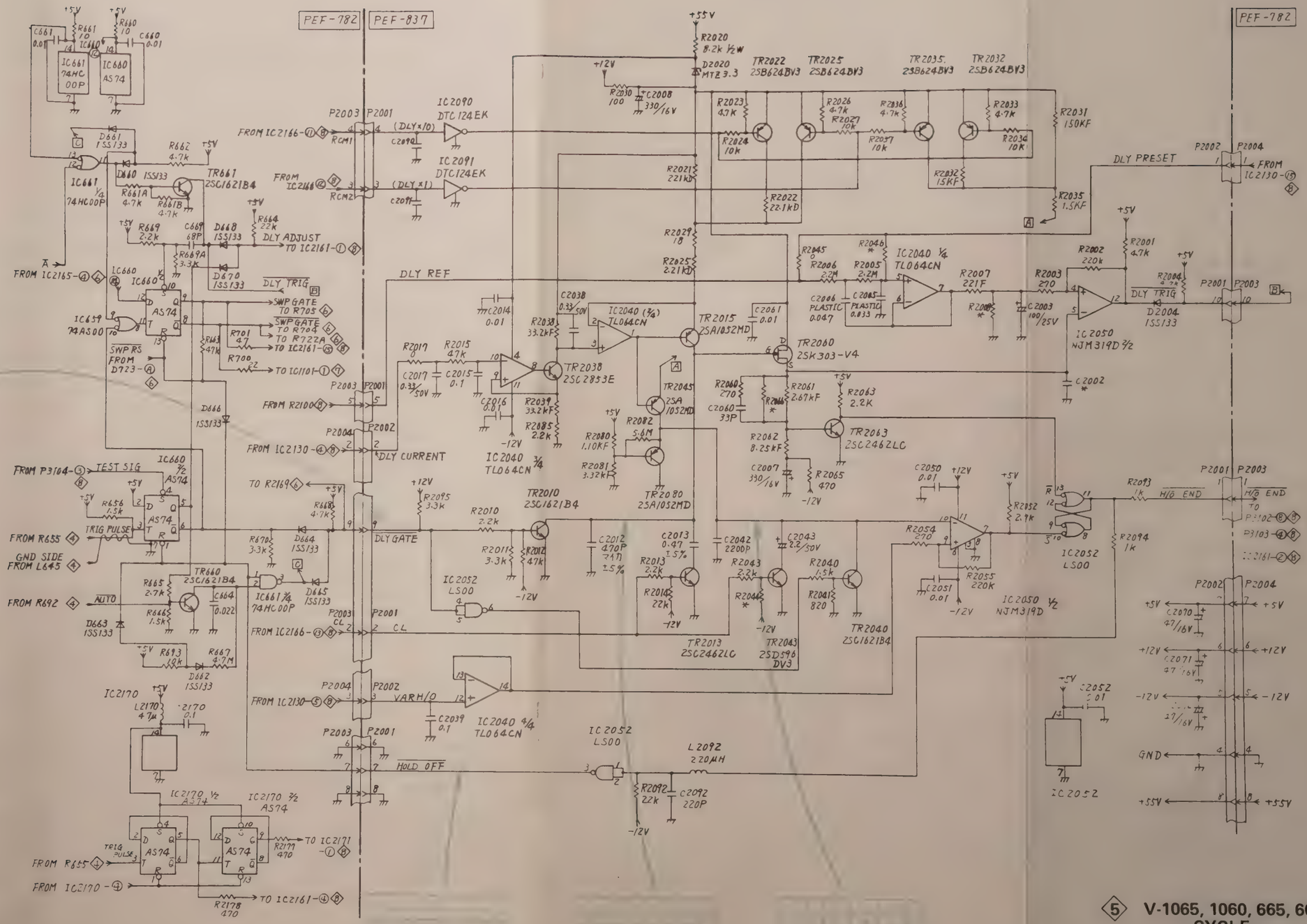
③ V-655, 660
V. OUT AMP
PEF-785



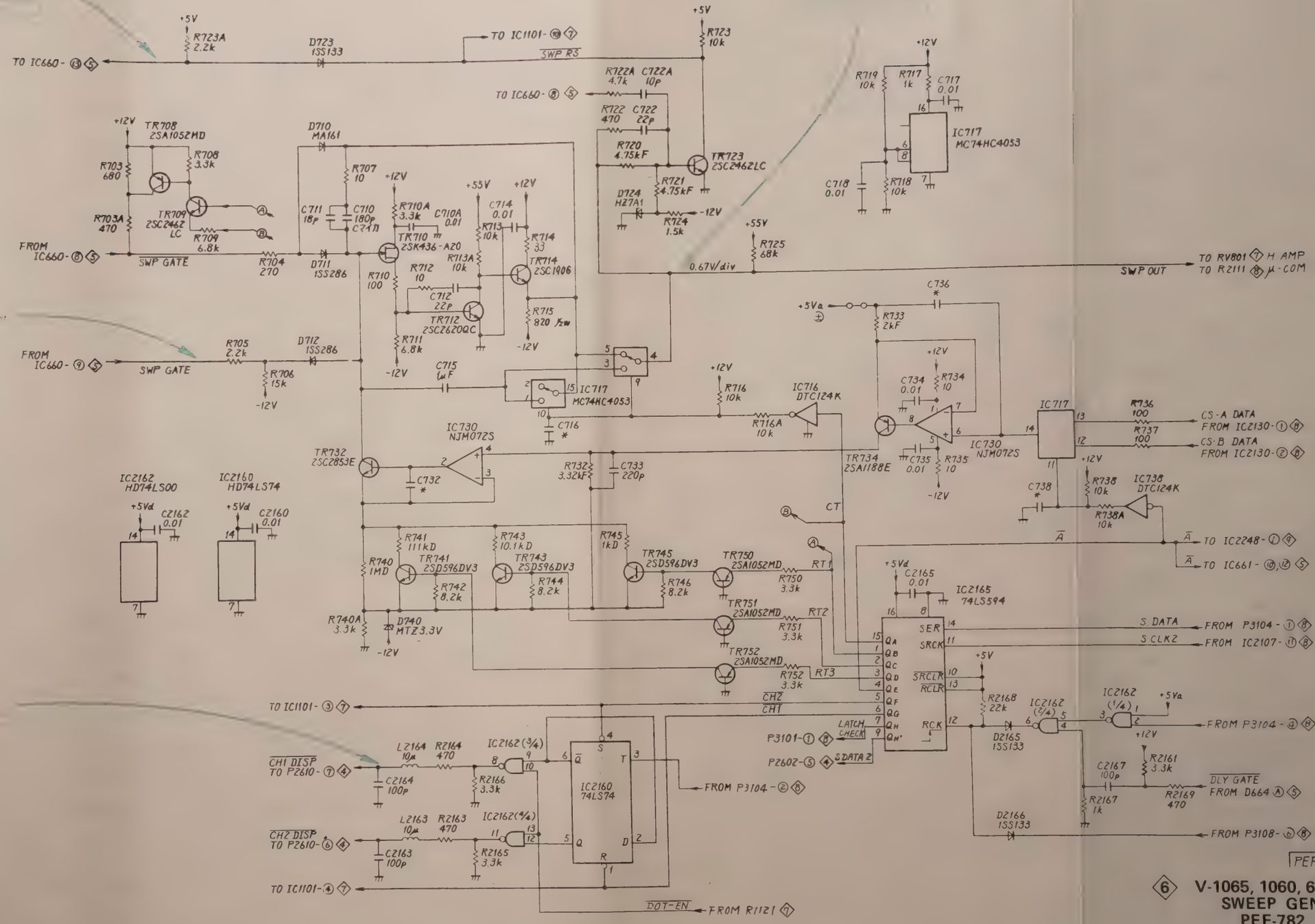
③ V-1065, 1060
V. OUT AMP
PEF-785



④ V-1065, 1060, 665, 660 TRIG AMP & TRIG GEN PEF-781, 782

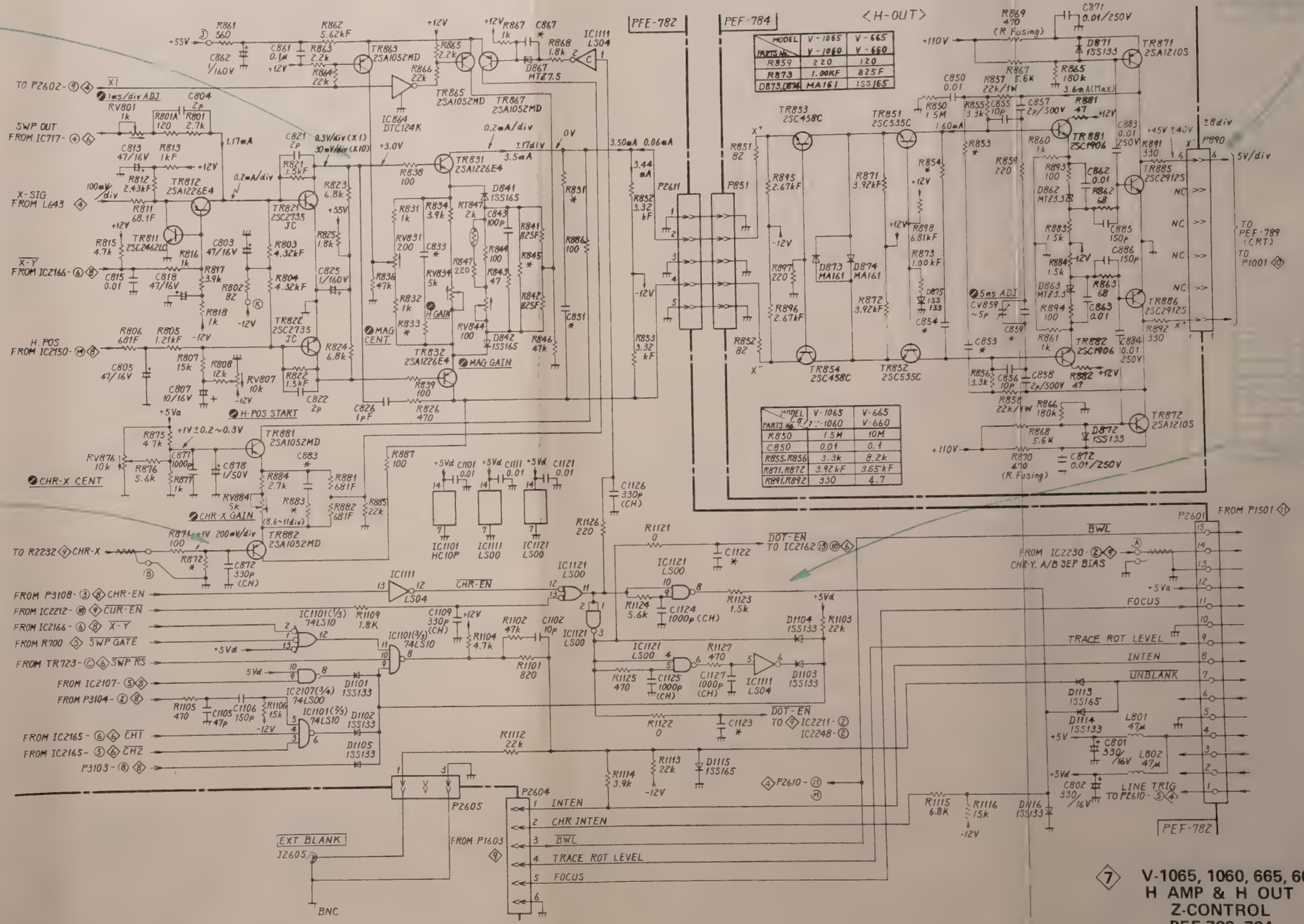


5 V-1065, 1060, 665, 660 CYCLE PEF-782, 837

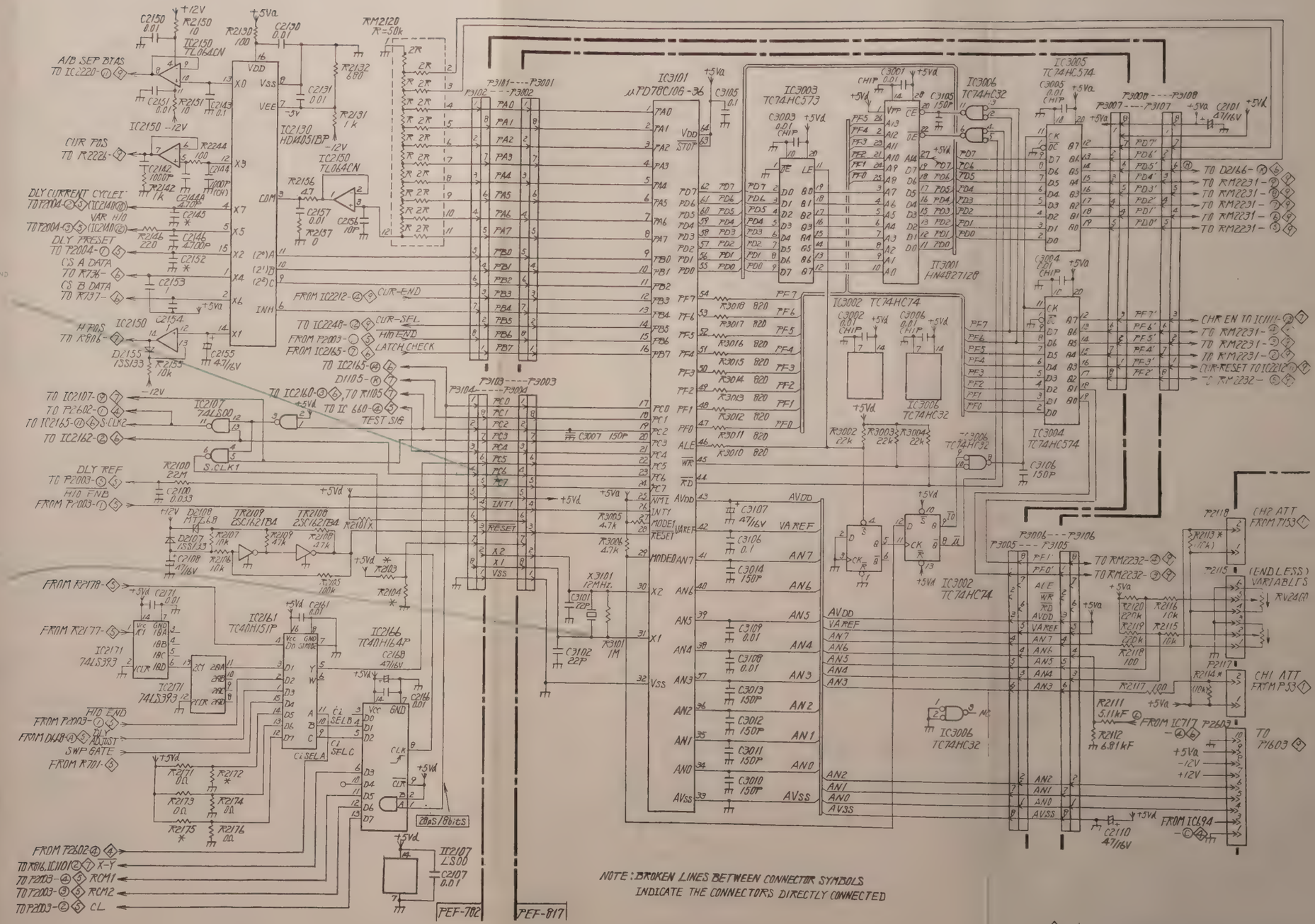


PEF-782

⑥ V-1065, 1060, 665, 660
SWEEP GEN
PEF-782

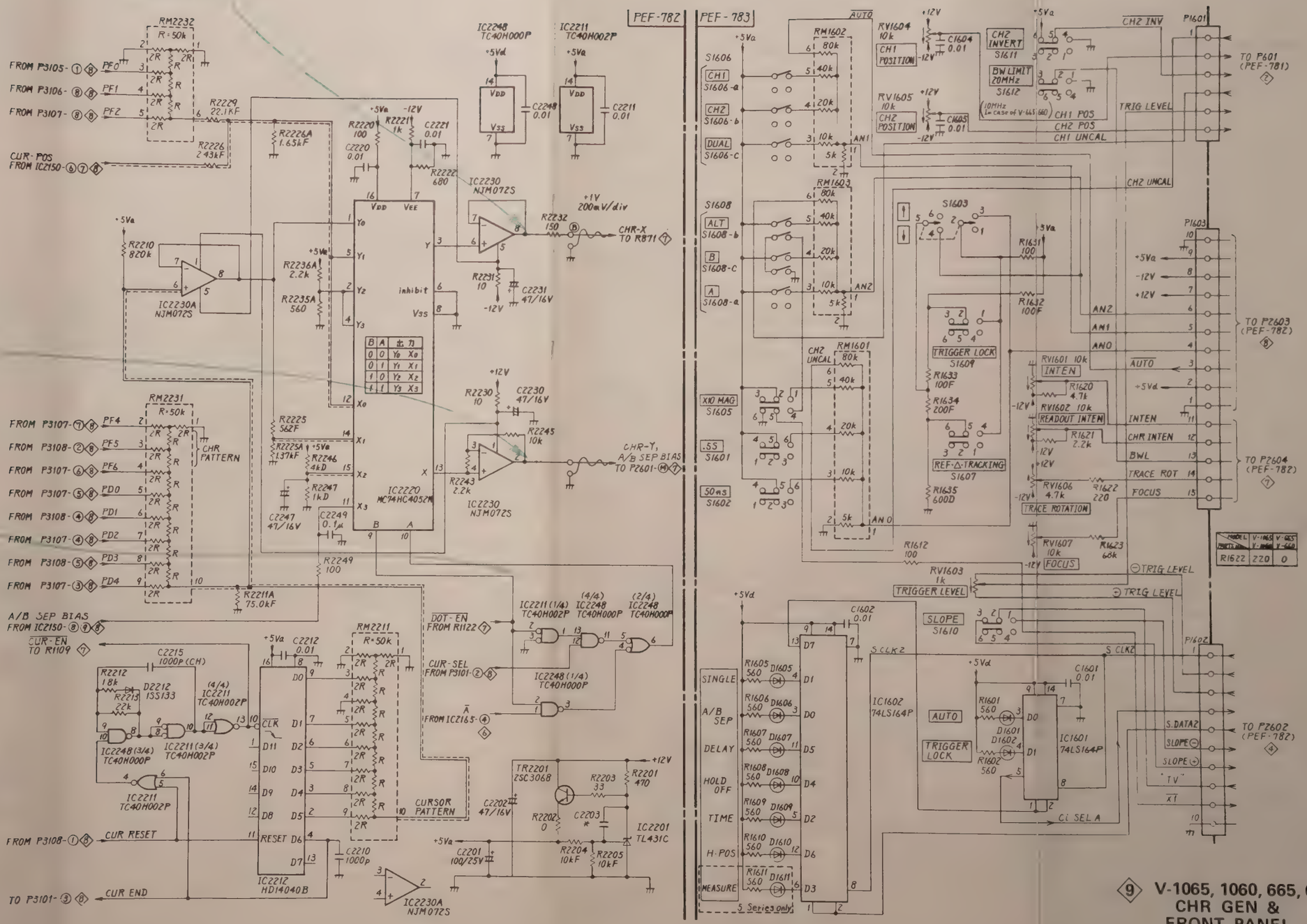


7 V-1065, 1060, 665, 660
H AMP & H OUT
Z-CONTROL
PEF-782, 784

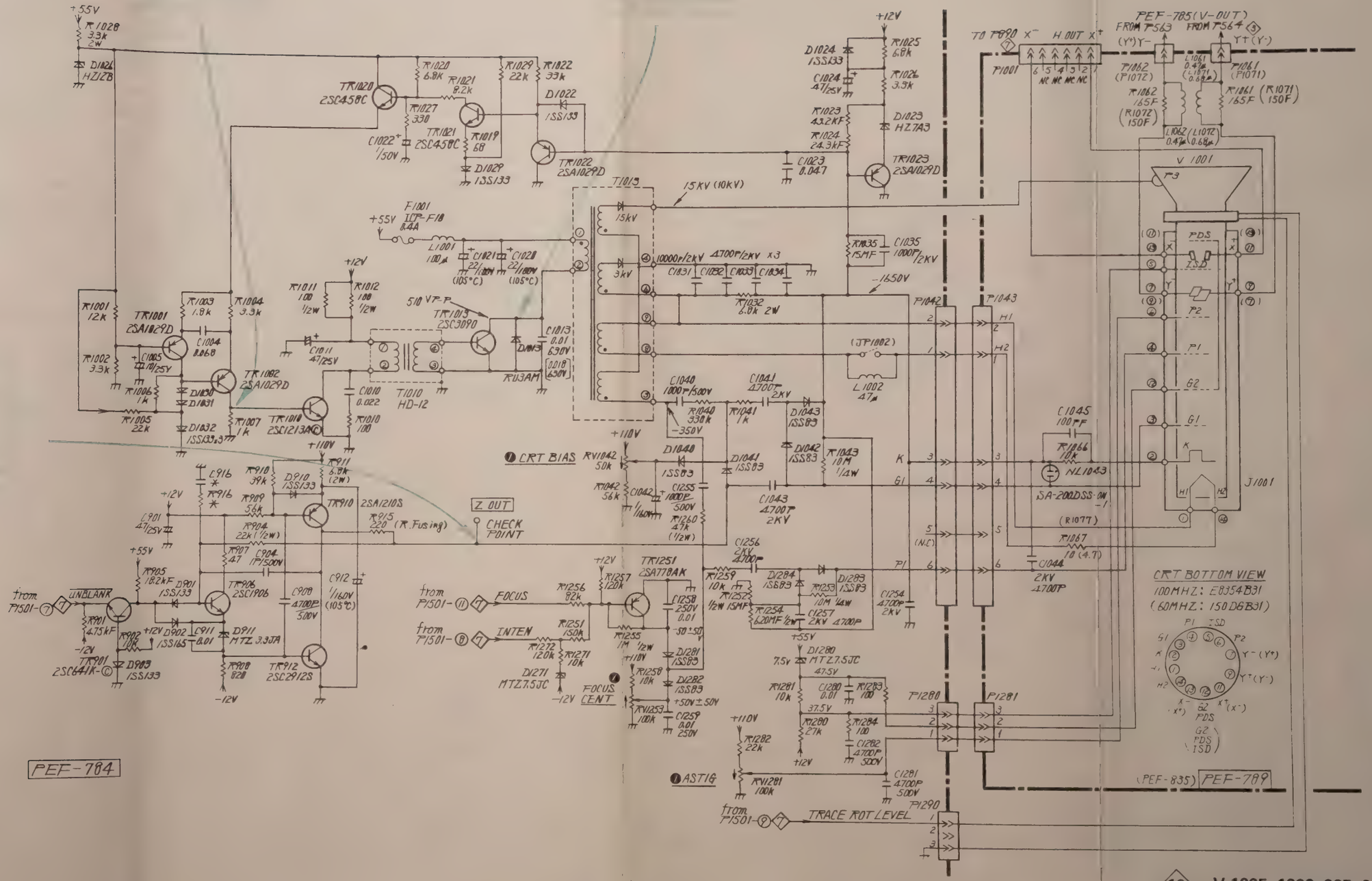


NOTE: BROKEN LINES BETWEEN CONNECTOR SYMBOLS INDICATE THE CONNECTORS DIRECTLY CONNECTED

⑧ **V-1065, 1060, 665, 660 μ-COM & ROM PG PEF-782, 817**

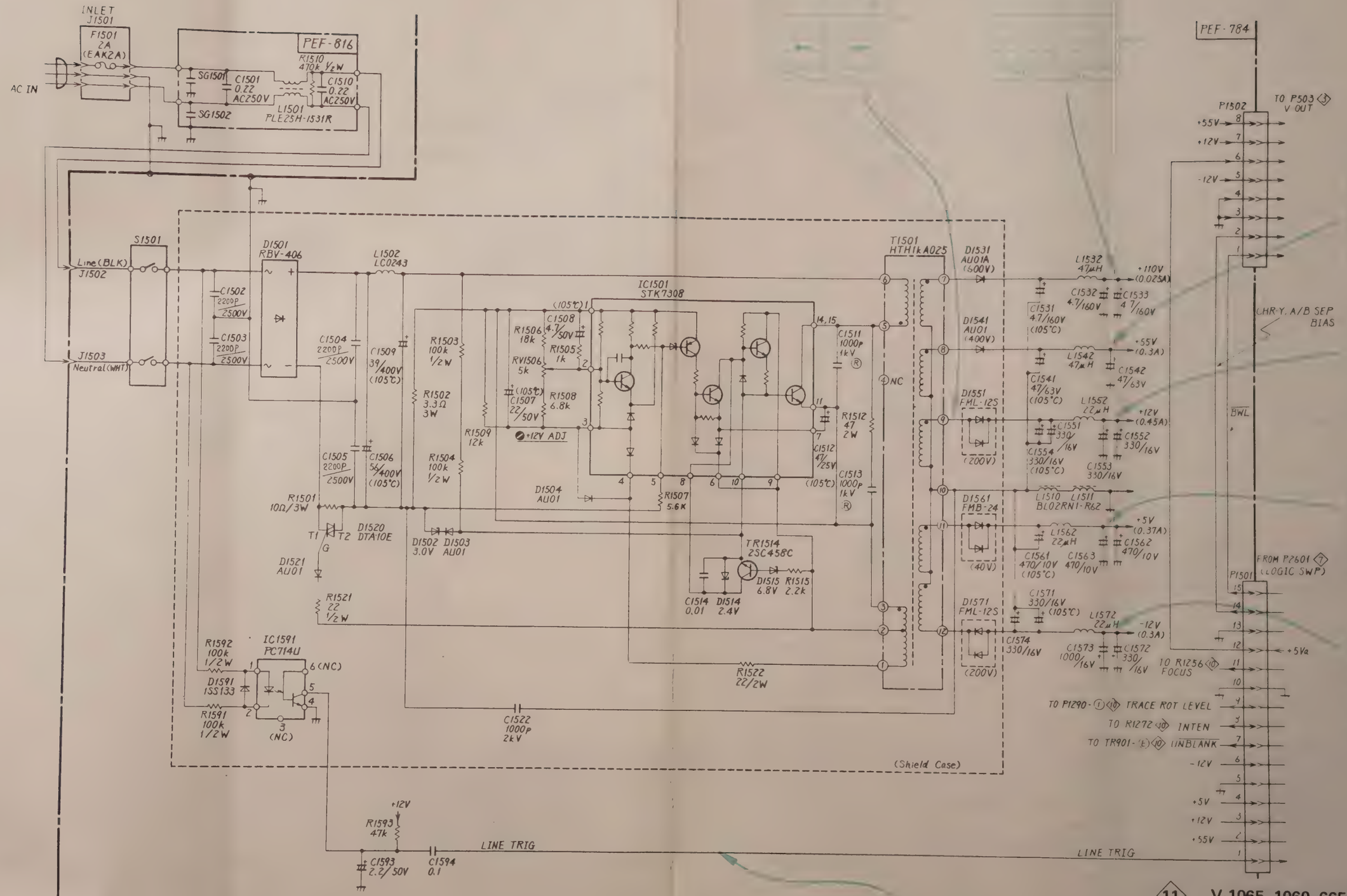


⑨ V-1065, 1060, 665, 660 CHR GEN & FRONT PANEL PEF-782, 783

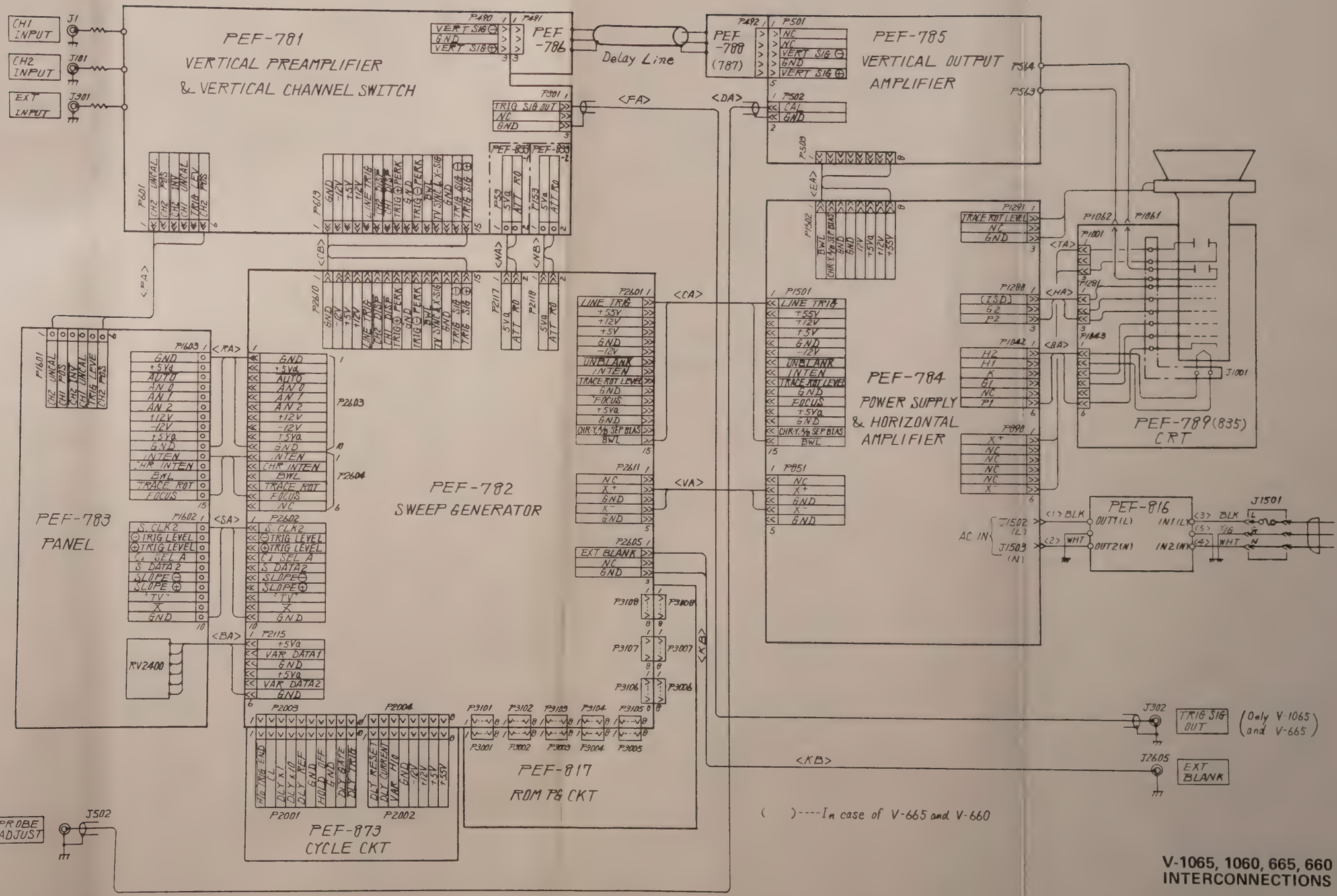


( ) ···· In case of V-665 and V-660

10 **V-1065, 1060, 665, 660**
HV, Z, CRT
PEF-784, 789



(11) V-1065, 1060, 665, 660
POWER
PEF-816, 784



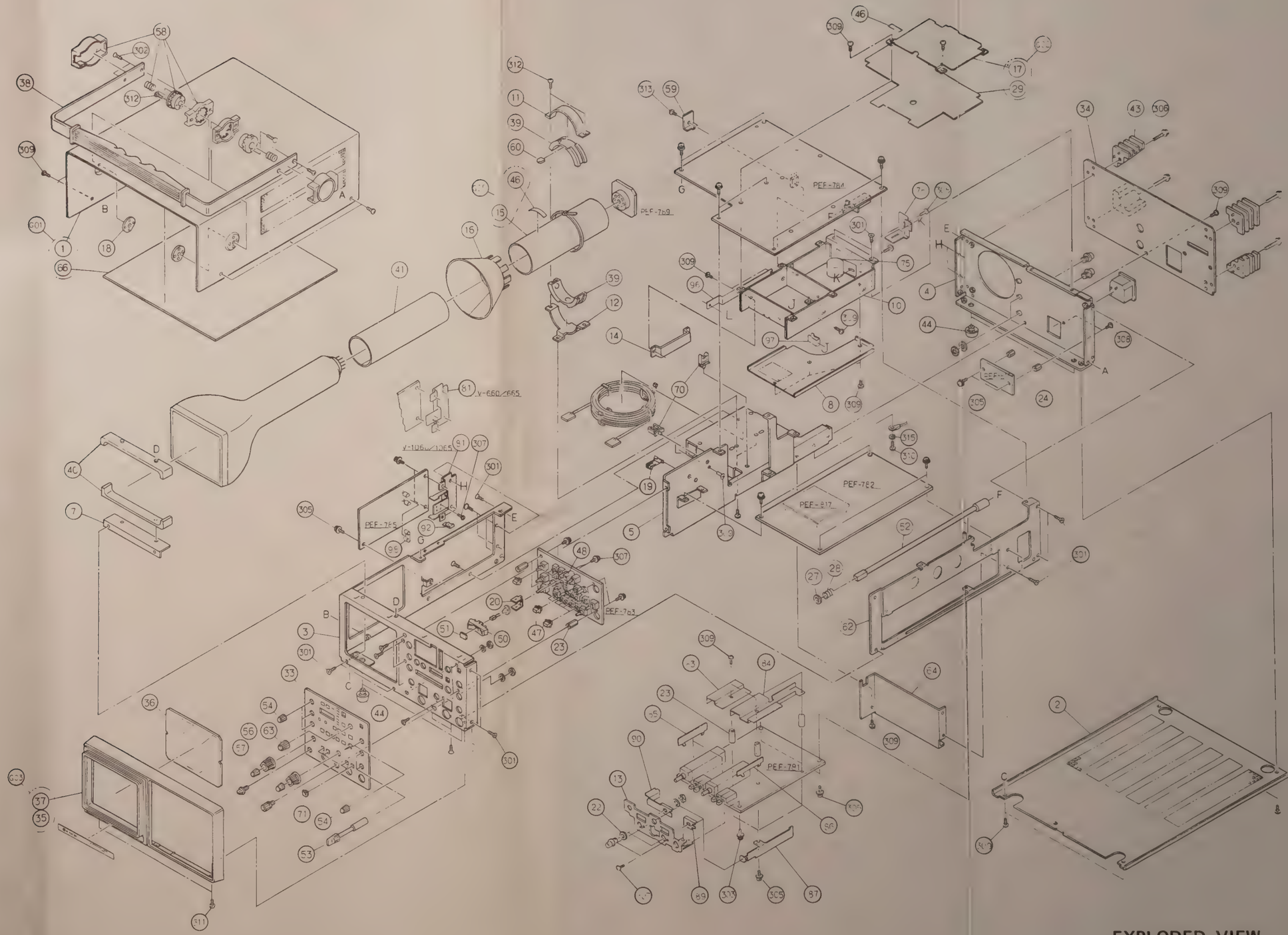
V-1065, 1060, 665, 660 INTERCONNECTIONS

11. MECHANICAL PARTS LIST AND EXPLODED VIEW

A:V-660, B:V-665
C:V-1060, D:V-1065

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
G01	8481303 A	Cover Assy Top	1	1	1	1		
1	3208912 A	Cover Up	1	1	1	1		
66	8480108 A	Insulater	1	1	1	1		
G02	8481305 A	Shield Case Assy	1	1	1	1		
17	8481953 A	Shield Case	1	1	1	1		
29	8481954 A	Insulater	1	1	1	1		
G03	8481317 A	Frame Assy				1		
G03	8481317 B	Frame Assy			1			
G03	8481317 C	Frame Assy		1				
G03	8481317 D	Frame Assy	1					
35	8474930 A	Name Plate				1		
35	8474930 B	Name Plate			1			
35	8474930 C	Name Plate		1				
35	8474930 D	Name Plate	1					
37	124512 A	Flame	1	1	1	1		
G05	8487161 A	Shield Band Assy			1	1		
	8487161 B	Shield Band Assy	1	1				
15	8316268 C	Shield Band			1	1		
15	8316268 D	Shield Band	1	1				
46	4058852 A	Label	1	1	1	1		
2	3208913 A	Cover Bottom	1	1	1	1		
3	2120502 AA	Chassis Front	1	1	1	1		
4	2119570 AA	Chassis Rear	1	1	1	1		
5	2119571 AA	Chassis C	1	1	1	1		
7	8469150 A	Bracket	1	1	1	1		
10	3212569 AA	Shield Case	1	1	1	1		
11	8438037 A	CRT Band	1	1	1	1		
12	8448099 A	CRT Band	1	1	1	1		
13	3209528 A	Bracket	1	1	1	1		
14	8472571 A	Bracket HIC	1	1	1	1		
16	8474963 A	Shield Case	1	1	1	1		
18	8398476 A	Nut Plate	2	2	2	2		
19	8474935 A	Plate Earth	1	1	1	1		
20	8474942 A	Bracket	1	1	1	1		
22	8398477 A	Spacer BNC	3	3	3	3		
23	8474929 A	Spacer	7	7	7	7		
24	8474929 B	Spacer	2	2	2	2		
27	8476833 A	Washer	1	1	1	1		
28	8483079 A	Spring	1	1	1	1		
33	3211032 A	Panel Front				1		
33	3211032 B	Panel Front			1			
33	3211032 C	Panel Front		1				
33	3211032 D	Panel Front	1					
34	3209561 A	Panel Rear		1		1		
34	3209561 B	Panel Rear	1		1			
36	8395445 A	Filter	1	1	1	1		
38	3208902 A	Handle	1	1	1	1		
39	3144055 B	Ruber	2	2	2	2		
40	8395443 A	Ruber	2	2	2	2		
41	8396867 C	Ruber			1	1		
41	8396867 D	Ruber	1	1				
43	3149317 C	Foot Rear	4	4	4	4		
44	3022087 A	Foot Bottom	4	4	4	4		
47	8473487 A	Button	13	14	13	14		
48	8474945 A	LED Holder	1	1	1	1		
50	3211025 A	Knob	1	1	1	1		
51	8474947 A	Cap	1	1	1	1		
52	8474939 AA	Knob-PW	1	1	1	1		
53	8473750 AA	Knob-L	2	2	2	2		
54	3149324 H	Knob-S18B	5	5	5	5		
56	3196622 F	Knob-ATS	2	2	2	2		

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	B	C	D	E	F
57	3149324 J	Knob-S18B	2	2	2	2		
58	8377076 A	Stopper Handle	2	2	2	2		
59	8456381 C	Bracket, IC	1	1	1	1		
60	8446132 A	Plate Earth	1	1	1	1		
62	2121662 AA	Chassis L	1	1	1	1		
63	3196650 D	Knob-M	1	1	1	1		
64	8480105 A	Shield Plate	1	1	1	1		
70	8383455 B	Saddle	2	2	2	2		
71	8446145 B	Guide Knob	4	4	4	4		
75	8487187 A	Short Ring	1	1	1	1		
76	8487185 A	Heat Think	1	1	1	1		
81	8484995 AA	Heat Think			1	1		
81	8480112 A	Heat Think	1	1				
83	8485001 A	V-PRE Shield (1)	1	1	1	1		
84	8485015 A	V-PRE Shield (2)	1	1	1	1		
85	8485003 A	V-PRE Earth (1)	2	2	2	2		
86	8485004 A	V-PRE Earth (2)	1	1	1	1		
87	8485005 A	V-PRE Earth (3)	2	2	2	2		
89	8485006 A	Earth Plate (1)	1	1	1	1		
90	8485007 A	Earth Plate (2)	1	1	1	1		
92	8472331 A	Clip			2	2		
96	8487186 A	Heat Think	1	1	1	1		
97	8487166 A	Heat Think	1	1	1	1		
98	8427119 B	Cap	1	1	1	1		
301	XCA7306	Screw Flat 3x6	26	26	26	26		
302	XCA7410	Screw Flat 4x10	4	4	4	4		
303	8340167 M	Screw Sems 3x6	3	3	3	3		
305	XCA0661	Screw Sems 3x8	26	26	26	26		
306	8340167 C	Screw Sems 4x20	4	4	4	4		
307	XCA6205	Screw 2x5	8	8	8	8		
308	XCA6306	Screw 3x6	3	3	3	3		
309	XCA6308	Screw 3x8	24	24	24	24		
310	XCA6408	Screw 4x8	1	1	1	1		
311	XCA1818	Screw Black 3x8	3	3	3	3		
312	XCA6316	Screw 3x16	6	6	6	6		
313	XCA6310	Screw 3x10	1	1	1	1		
315	XCA1881	Washer Spring	1	1	1	1		



EXPLODED VIEW

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